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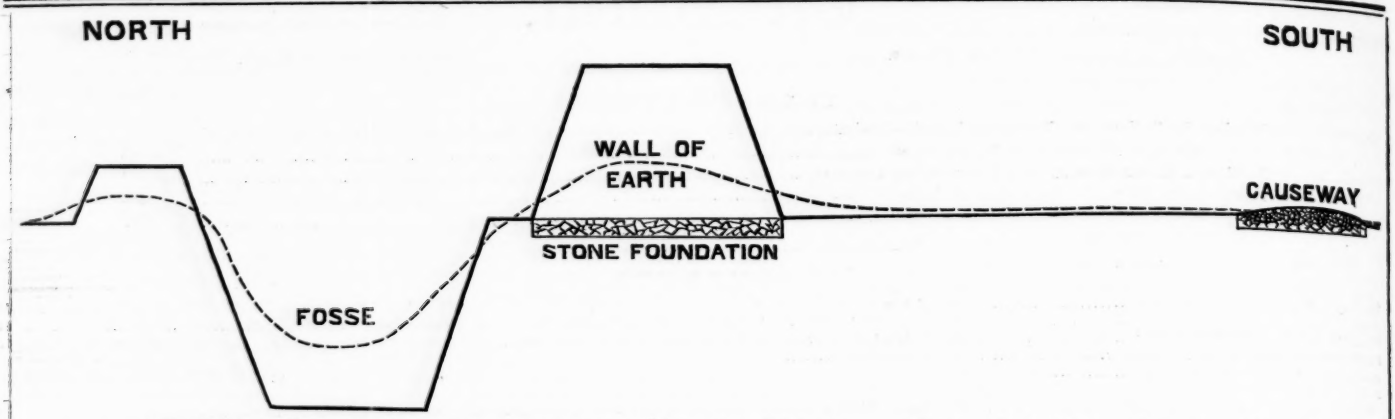
The Roman Wall in Scotland.

WITHIN thirty minutes' walk of the outskirts of Glasgow, on the north-west, and well overtaken by the five-mile radius from the Royal Exchange of that city, is still to be found a small, but wonderfully-preserved portion of the military barrier which Antoninus Pius caused his legions to draw across the isthmus between the Forth and the Clyde, A.D. 140. Although thus at the doors of the citizens, so to speak, with an excellent public road hard by, its existence is not at all generally known to them,—perhaps not generally known even to those of them who are distinctly smitten by the infection of antiquarian research. The best parts of the Roman Wall between the Forth and the Clyde, as pointed out in a former *Builder* article, are to be found on its mid-sections between Kirkintilloch and Falkirk, the remains discoverable to east and west of this great central stretch having, as a rule, made more rapid progress to the goal of complete effacement. Nevertheless, both to east and west of this central stretch exceptional vestiges are to be found,—to wit, a carefully-tended portion within the park ground of Callendar House to the east, and to the west this other most interesting sample, situated quite within the suburban area of Glasgow, and now to be more particularly referred to. Examined on a modern map, the work of the engineers of Lollius Urbicus, the general who then commanded the imperial forces in North Britain, is found entering Stirlingshire from the east after traversing half the breadth of Linlithgowshire. Thence it passes into a detached portion of Dumbartonshire, which ultimately leaving, it dips for a mile or two just within the north-western border line of Lanarkshire, after that re-entering Stirlingshire at a narrow south-western spur of that county, and finally passing into Dumbartonshire mainland, where the western termination of the work has place.

From Kirkintilloch westward the remains are generally difficult of recognition, except to the practised eye; but on Ferguston Muir, within the south-western spur of Stirlingshire, above alluded to, and close to the point where the three last-named counties meet, there is a short strip which has been little affected by the hand of man since the date of its construction, in the year 140, and not very much by the influence of the elements. Ferguston Muir, once of wide extent, borders the north-west turnpike out of Glasgow on the route to Strathblane and Aberfoyle. It is not quite five miles from the centre of the city, and near to the point in question the Loch Katrine Aqueduct cuts in upon the ground, crosses the site of the wall, and passes citywards. The major portion of it has long since been "de-moored" under the gradual advance of tillage operations and experiments. Quite recently the encroachments of suburban villa builders have further pared away what agriculture had spared, and, the upland being breezy and healthful here, if Glasgow flourishes as it has done, perhaps the whole of it is bound to go the same road some day. But that time is not quite come yet, and a small part of the moor remains, unmolested apparently for nearly seventeen and a half centuries, and with the trench of Lollius Urbicus scored across it about as plain as ever it was. A country road (which at this point is no less than the ancient military way itself,—that military way which accompanied the barrier over the whole of its length at a variable distance southward, rarely exceeding 150 yards, and traces of which are here and there still discernible), skirts the moor from the direction of New Kilpatrick, after crossing at right-angles the main turnpike above mentioned, and thence mounting a somewhat steep rise of the ground which here occurs. The small portion of the moor still undisturbed is bounded on the south by this parish road,—or forgotten military causeway, rather,—while to the west, and of very moderate acreage indeed, there is a field in tillage which is all that now shields the relict from the onward march of the villas with which the road is becoming fringed, the latest built and most advanced of these being only at the further breadth thereof, and perched right on the site of the all but rubbed-out Roman work itself. Fields in crop or grass adjoin to the north and east, and also on the other, or southern side of the parish roadway. The strip of virgin moor possesses, perhaps, barely 200 square yards of area in all, and from the road there is nothing out of the way to catch the eye, the Roman work being visible, indeed, in the swelling of the southern agger, but not in such a manner as, at that distance, to suggest anything more than the natural surface contour of a patch of unproductive ground. It is only when the wire fence has been furtively violated, and the one hundred and fifty yards' breadth to the north traversed, that the truth of the matter begins to be dreamed of. Such chanced, a few weeks ago, to be the incidental experience of the writer, who certainly knew himself to be not far from the line of the Roman vallum, and was unquestionably on the scent for traces of it in thus incontinently constituting himself a trespasser, but had not the faintest notion that here, so far to the west, a really "good bit" was still existent. On gaining the summit of what seems at first but a broad natural furrow, but which is, indeed, the southern agger of the work, only a good deal flattened, the fosse or ditch at the feet of the spectator at once stands confessed, the bottom partially clogged, but still in well-defined measurements, and in shape and cutting virtually as the Roman digging implements left it. For a stretch of nearly three hundred yards the work proclaims itself in lines unmistakably bold, and at either extremity where the trench suddenly levels up into fields long under tillage, the course of the obliterated vallum is still discovered to the eye by a streak of differently-tinted vegetation, as if the throwing out of the ditch earth and (after some centuries) the filling of it in again had made a lasting mark on its capacity for grass growth. Across the unreclaimed portion of the moor the ancient barrier holds its way quite regular and unbroken, the fosse from 8 ft. to 10 ft. of clear depth, and at least 20 ft. wide from lip to lip. Measurements varied at various parts of the Roman wall in Scotland, according to the exigencies of the position for attack and defence, and here it has been by no means of quite maximum proportions, but rather of a size midway between the largest and the average. As a specimen, however, it is scarcely inferior to the best preserved portions still existing in the neighbourhood of Castlecary, Roughcastle, and Tamfour, a little to the west of Falkirk. The main agger, or wall of earth, on the south brink is of course trained off in its angles and altitude by centuries of beating down action on the part of the elements; but it is there distinct enough over the whole of the 300 yards (or thereabouts) of moor remnant, and its summit level is still to be measured by feet. According to the plan followed by the Roman military engineers, the earthen wall, when making its way across morass ground, rested on a foundation of roughly-dressed stone laid in thinnish courses of from 10 ft. to 18 ft. broad, and here such foundation exists still, to be unearthed by comparatively small exertion of spade work although concealed from the unaided eye. It is, indeed, well on record that from this point on Ferguston Muir eastward for about a mile the proprietor of the ground quite early in last century systematically levelled the main agger of the work, and in doing this filled up the fosse, in order to quarry and carry away a sufficiency of the Roman foundation stones wherewith to build the new park wall he had decided to erect, and in this wall surrounding the neighbouring demesne of Douglaston these



The Scottish Roman Wall in Profile, as constructed. (*The line of dots shows existing condition where well preserved.*)

stones are to be seen to this day. The agger on the north bank, always of small size as compared with its southern companion, and certainly not continuous from sea to sea, is distinctly visible on the Ferguston patch ; thickish turf grass clothes the whole, down even to the bottom of the fosse, the sides of which also afford growth space for some scanty shrubwood planted promiscuously by the unstudying hand of nature. The only modern contrivance traceable to the hand of man is an open runlet of small dimensions cut by some rural drainsman from end to end along the bottom of the trench (a ditch within a ditch), dry in summer, and in wet times carrying off the superabundant moisture to a neighbouring burn. For the most part devious in the course pursued, the Roman work is remarkably so in the section of which this Ferguston strip forms a fraction, more particularly after passing the site of the fort where New Kilpatrick now stands, and until that of Kirkintilloch is caught up. The land here is almost wholly reclaimed now, the very small fragment, above particularised, being about as belated a portion as any, although, considered as no more than a bit of waste ground, it also may be held as fairly drained. Morass surface must have been painfully abundant in the second century of the Christian era, however, and, as we now see, the Roman work perforce became uncommonly erratic of gait, perpetually zig-zagging in obtuse angles with the view of picking out the least unpromising of the rather unfavourable routes which were alone at disposal.

The Roman wall here, as elsewhere along its course, is locally known as "Græm's Dyke," and the story has been told times without number how that a Caledonian chieftain named Græme bore from his northern fastnesses in force upon the barrier of the invaders, throwing down a portion of it, and thus carving out a passage for himself and his followers, with the result that the people at once took to calling the rampart by the new name of "Græme's Dyke," and persevered in that ever after. In some accounts the actual spot where this alleged forlorn hope exploit took place is set down, but the whole story bears strong suspicion of gratuitous fabrication, the original author having most likely simply set his faculty of invention to work to account for the otherwise incomprehensible title of "Græm's Dyke," some centuries after the original signification of the word Græm, or Græms, or Grime had been forgotten. Doubtless, the Caledonians early found their way to the south of the barrier by simple dint of swarming into the ditch (for the most part dry), and climbing out of it again and over the agger on the opposite side,—a feat not calling for any extraordinary exertion on the part of mountaineers, at least, at points where the work was unguarded by soldiers,—but the special violation put to the credit of the mythical Græme must be held in the main as apochryphal, since, unfortunately for the ingenious bit of North British fiction, there are extant in England (Oxfordshire and Hampshire, for example) various bits of Roman work of similar earthwork construction, also known locally as "Grimes" or "Grimm's" Dyke. It is almost beyond all question that the term Græm or Grimm is generic ; and that the Græm of Scotland and the Grime or Grimm of the south of England (perhaps also the "Grim" of Grimsby) are one and the same. It has been hazarded that the title is of Celtic parentage, and simply means the "black" dyke; but this effort at solution hardly affords satisfaction, for the aggers and ditch, although no doubt black and grimy enough when fresh from the spade, would speedily become covered with a growth of vegetation. However, by the title of Græme's Dyke or by any other name the wall of Antoninus Pius is but little noticed or discussed on the part of the people through whose towns and fields it passes. Population abounds in the neighbourhood of Falkirk, Kirkintilloch, the two Kilpatricks, and Dunlocher, and especially where the ancient Roman work all but touches Glasgow, but probably out of the inhabitants of these places (Glasgow included) not one in ten thousand ever consciously saw a bit of it. The small portion above described is, of course, no new discovery, being well enough known to a handful of people. It is also duly mentioned in Horsley's "Britannia Romana," published in 1732 and recognised as well preserved then, but even so recently as 150 years ago good bits were much more plentiful than now, and the mention accorded is after all only a passing one.

NOTES.

THE verdict of the jury on the Exeter Theatre fire, which all our readers will have seen in the daily papers of Thursday, is no doubt what may be called an indignation verdict, and on one or two points the remarks made are certainly very unreasonable; as, for instance, that if the architect had raised the roof of the auditorium it would have carried up the smoke and allowed the audience time to escape. This was in accordance with the evidence of one witness, but that was merely the witness's opinion, not a statement of fact, and no raising of the roof would have really made any appreciable difference in the collection of the smoke, unless it had been raised to a height quite unreasonable and such as would have injured the acoustic qualities of the theatre. But in general, the verdict, strong as it is, must be accepted, as far as we can gather from the evidence, as a just one. The licensing magistrates must bear considerable responsibility for their carelessness in not satisfying themselves that the changes they required had been carried out; but we fear it is impossible to deny that the main *onus* of the matter rests on the architect, Mr. Phipps, who, as a theatre-building specialist, ought to have been the person to be most urgent in insisting on every possible structural precaution being taken, whereas he appears to have adopted the opposite part of making light of the requirements and even promising things which he never took care to see performed. We do not say that any one is responsible for all the fatal result, because in the panic in which the gallery audience obviously were we believe they would not in any case have got out without some fatal results ; but there can be no doubt that the catastrophe was rendered much worse than it might have been owing to the structural defects in the building. The main factors in this were the want of sufficient exit from the gallery, the want of a fire-resisting curtain at the proscenium (we purposely avoid the word "fireproof"), and the existence of the door in the wall between the stage and auditorium portions of the house, through which the smoke seems to have obtained direct access to the gallery stairs. The partition wall itself being thinner than the Board of Works' requirements did not affect the result in this case, though we hold that the wall between stage and auditorium portions should rather be 18 in. than 9 in. Of course, a theatre built as this was might have gone on safely for years, but a sudden fire finds out its weak points. We wish we could defend the architect, but we can see no ground for doing so. He seems to have gone into the matter with as light a heart as if fatal disasters from the burning of theatres had never been heard of. We regret this on more than personal grounds, since it casts a discredit on the architectural profession, which many ill-natured and illogical people will be eager to make the most of.

ALTHOUGH railways are of course made with the intention, or, at least, the hope of attracting commerce, very few have succeeded so far as the Canadian Pacific Railway in so short a time after its opening. Nor is it only the traffic of the country that it has monopolised, for that goes without saying, but it is that it has diverted already so much of the sea traffic. Japan, for instance, is having its trade revolutionised since the opening of the line, and particularly in the articles of tea and silk. Last year the great route for tea was through the Suez Canal, while the silk went to America *viâ* San Francisco. Now, however, the Canadian Pacific steamers take it for transport to Vancouver, and the Vice-Consul at Hiogo states it to be his conviction that in a very short time not only the tea, but a fair share of the general export trade, will go altogether by Vancouver. It is no wonder that the trade of some of the Japanese ports, such as Yokohama, should have increased during the year by 1,250,000*l*. One of the great increases, curiously enough, is in wire, the Japanese having, to a great extent, discarded their national bamboo umbrellas, and taken to making and wearing umbrellas and parasols on the European model.

WE hear that the Exhibition to be held at Glasgow next year will include one feature of remarkable interest. The promoters of the Exhibition, we are told, intend to do for sculpture what the Manchester Exhibition of this year has done for painting, and to form a representative collection of the sculpture of the last half-century. This is, indeed, news of interest to all lovers of art. At Manchester the splendid exhibition of paintings of the last fifty years was supplemented only by a few scattered works of sculpture, placed here and there as ornaments, but forming a very unimportant portion of the Exhibition. And it has been nearly the same in all similar Great Exhibitions, as far as we can call to mind. Sculpture has never been represented collectively on a large scale, and in a manner worthy of so great and intellectual a branch of art. The information reached us informally and in course of conversation, but we have no reason

to doubt that it is correct, and we wish the management of the Glasgow Exhibition every success in so admirable a proposal. It will draw many of us to Glasgow who might not otherwise go. It is to be hoped that the best advice will be sought in regard to the design, arrangement, and lighting of the sculpture galleries,—even more important with sculpture than with pictures.

IT is now a month since the Act was passed empowering the Richmond Authorities to form a joint Board to carry out the scheme of drainage designed by Mr. Melliss and approved by the Local Government Board, but as yet there are no signs that even the preliminary steps are being taken to form this Board. Richmond is the greatest sinner in the matter of discharging crude polluting sewage into the Upper Thames, and for sanitary reasons which affect a much larger constituency than the residents of the immediate neighbourhood it is highly desirable that the Richmond Authorities should proceed with the carrying out of this approved scheme without a day's delay. It is true that the Act relieves these Authorities for three years of any of the liabilities as to the penalities attached to the discharging of crude sewage into the Thames, but this immunity may be swept away, even within the three years, if the Local Government Board be of opinion that there is "unreasonable delay in the preparation for, or the carrying out of, the works." The Chertsey Authorities have just been fined 50*l.*, at the instance of the Thames Conservators, for allowing unpurified sewage to pass into the Thames. Indications are not wanting that the Conservancy Board mean now to enforce more actively than ever the full requirements of law against delinquent Authorities. It will be seen from a recent issue of the *Builder* that Acton, another of the Thames Valley Authorities, has completed a new scheme of drainage, and is now passing a clarified effluent instead of polluting sewage into the Thames.

WE are, of course, not going to make any suggestion at this juncture as to where liability lies for the miserable railway accident at Hexthorpe, but it is impossible to avoid a comment about the extraordinary and what seems to us, we confess, almost lunatic proceeding, which it appears is adopted by some railway managements, of suspending the block system on the days when there is an extra pressure of traffic. The block system was invented to insure trains against the disasters arising from one train overtaking and running into another that was stationary; a danger which was recognised as a serious one even when traffic was in a normal and regular condition. There comes a day when traffic has to be thrown out of its normal course and when there are extra chances of accident, and then the block system is suspended! Of course it may be replied that the working of the trains by flag signals is really a temporary block system on shorter lengths of line. So it is, if properly carried out; but to change the whole system suddenly, and to rely on a number of extra signallers, just at a time when there is extra risk on the line and when extra caution is required, does seem a most extraordinary proceeding. No doubt the passengers will grumble very much if they are kept waiting at a block signal box; nine-tenths of railway passengers are utterly ignorant and unreasonable in regard to the working of railways; but it is better that they should grumble in safety than be taken lighthearted into danger of a terrible death.

WE hear that Mr. H. A. Rogers, of New Southgate, has issued, in two large sheets, an etching of London, Southwark, and Westminster, as they appeared in the middle of the sixteenth century. The drawing is based upon N. Whittock's reproduction, or rather, as we should call it, amplification of Antony van den Wynegaarde's bird's-eye view,—sometimes known as the Sutherland view,—which is now preserved in the Bodleian Library at Oxford. When the Fleming made his ink and sepia drawing, *circa* 1550, the spire of old St. Paul's was *in situ*. But as regards the extent of the town, it is to be observed that many of the principal streets had but single lines of houses. In Rotherhithe, Lambeth, and Southwark there are scarcely any houses at all. Spitalfields, Goodman's-fields, and so between Ratcliffe and Wapping; Bloomsbury, and the ground between Pall Mall and Tyburn,—all is fields; whilst the greater part of Clerkenwell, Cripplegate, and Shoreditch parishes is vacant. Whittock's engraved drawing, to a smaller scale, though it makes a prettier picture than Wynegaarde's, cannot be taken as authentic for purposes of accurate topography, since it contains certain features which are not chronologically correct.

M. FOUCART, in the *Bulletin de Correspondance Hellénique* (1887, p. 129), publishes two inscriptions found at the Peiræus, which have a very general interest, as they deal with the rebuilding of the Long Walls by Konon. They also help to settle the site of the Temple of Aphrodite (Aphrodision), mentioned by Pausanias. He says (book i., 5):—"Near the sea there is a temple to Aphrodite, built by Konon, when he obtained the victory over the fleet of the Lacedæmonians off Cnidus in Caria." The inscription dealing with the Aphrodision runs:—"In the archonship of Euboulides, beginning at the sign, as you go to the right in front of the gates of the Aphrodision, 790 ft.; Demosthenes the Bœotian was contractor, together with the supply of stone." The other inscription reads:—"In the archonship of Diophantos, in the month of Skirophorion, for jobs by the day (*τὰ καθ' ἡμεραν ἔργα*) paid for teams bringing stone, 160 drachmas; iron instruments, 53 drachmas." M. Foucart fully discusses the inscriptions and gives a plan of the portion of the topography of the Peiræus to which they refer.

THE "Società delle forze Idrauliche," in its recent excavations at the so-called "Villa of Mæcenas," seems to have at length happily set at rest the name and purport of that problematical building. Nibby's conjecture proves now to be correct. It is no villa at all, but a part of the Heracleion, a temple of approximately the same shape as the Temple of Fortuna at Præneste. A fragment has been found bearing the inscription, "Æditui H(erculis Victoris)." Several "cippi" are inscribed "Curatores fani Herculis Victoris," also a fragment of a cornice in which the club of Hercules appears repeatedly as a decorative motive. As yet the full plan of the temple and the extent of its dependencies is not made out, but the Society, to whom the site belongs, intend thoroughly to explore the whole building. A provisional account appears in the *Notizie degli Scavi di Antichità* (1887, p. 25), by Sig. Luigi Borsari, who publishes a number of the inscriptions. A full account, with topographical map and architectural details, is promised shortly.

FROM the annual report of the Hellenic Society, just issued to members, it appears that the Council have determined to alter the form of the *Journal* of the Society to Imperial 8vo., and to include the plates with the text, instead of issuing an extra atlas of plates. A double folding page will be used where any illustration is required larger than the page size. The change will be for the better: it is troublesome to keep a periodical in a dual form. There is also to be added to the *Journal*, as soon as it can be arranged for, a supplement, giving a notice of new publications on Greek archæology, and a summary of foreign periodicals. This will be a very valuable addition.

WE believe the last contribution to periodical literature by Signor Gozzadini (whose loss to Italian archæology we have so recently had to deplore) was a paper in the *Revue Archéologique* on the very curious sepulchral reliefs in the Museo Civico at Bologna. The most casual tourist who has wandered through the Museo Civico,—we say advisedly the best-arranged classical museum in Europe,—must have been struck by these reliefs. They are so unlike anything to be seen elsewhere. In fact, they are unique, found only in the necropolis of Felsina. Up to the publication of this monograph they were but little known to the general public. The most usual subject of the designs is the departure of the soul for the lower world. This is represented by a warrior in a chariot drawn by winged horses, or by a scene of parting. The style of the reliefs can now be conveniently studied in the four plates with which Signor Gozzadini accompanies his article. It has been his life's work to elucidate these antiquities at Bologna, and it is right that it should be widely known that the Museo Civico owes much of its perfection to his care.

WE have received some specimen plates of a work which is being brought out by Mr. E. L. Conder in illustration of the noble church of Long Melford, in Suffolk. The drawings sent us are admirably executed, and show the greatest care in the carrying out of the work, and if the whole publication is equal to these it will be one of the best of our monographs of English buildings.

THE Metropolitan Railway Company have, as we lately mentioned, opened their line to Rickmansworth, thus laying themselves out for a certain amount of purely country and long-distance traffic. Baker-street thus becomes a terminus, but of all stations in London it would be difficult to find one worse adapted for this purpose. To endeavour to carry on a long-distance traffic in a manner satisfactory to the public or the shareholders a proper terminus is necessary, and such a one should have been made at Baker-street before the Rickmansworth extension was opened. It was the more necessary to undertake this work because the present station, whether we regard that part of it used for the main-line traffic or that in which the northern trains arrive and depart, is the most inconvenient and unwholesome in the metropolis. After being nearly suffocated in the main portion, a passenger is almost squeezed to a pancake or pushed on to the permanent way when on the narrow platform of the St. John's Wood line. This want of accommodation at Baker-street is the more noticeable because the stations on the northern extension are large and well-designed buildings.

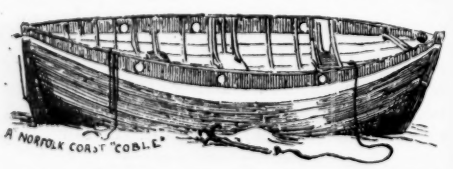
WE have received a prospectus of a proposed art exhibition to be held at Derby in the month of December and January next. It is to be divided into three sections: I. Non-competitive, for professional artists only, including the leading branches of the fine arts; II. Competitive, for local amateurs; III. Competitive, and open to professional or amateur artists alike and independent of locality. This latter class includes a variety of the minor arts to which lady amateurs are more especially devoted, such as paintings on opal, crystoleum painting, designs for Christmas cards, &c., as well as the more orthodox applied arts included under the term "art-needle work." There is likely to be a fine conglomeration of curiosities under this heading. There may very likely be a good collection in the non-competitive and purely exhibition section, as many artists are glad of a new opportunity of exhibiting their works at a time when most both of the London and provincial exhibitions are closed. But we do not augur much for the rest of the exhibition, and the selection of the judges is rather a puzzle to us. There are only three judges announced to pronounce upon and adjudge prizes for all this variety of work, and not one of them is an artist, as far as our knowledge of their names tells us. Mr. W. H. Goss, F.G.S., of Bank House, Stoke-upon-Trent, and Mr. H. J. Fenton, Waterdale, Doncaster, are, we presume, amateurs taking an interest in art; Messrs. Raphael Tuck & Sons, fine-art publishers, whose names are well known in that capacity, form the third person of this trinity of judges. With all respect to these gentlemen, we think it is rather presumptuous of them to invite artists, professional and amateur, from all parts of the country, to submit works to their judgment for the award of medals; and if they have, as the phrase is,

"power to add to their number," they would do wisely to invite the assistance of one or two artists of known standing; they will be more likely to have a good exhibition in that case.

NOTES OF A HOLIDAY ON THE NORFOLK COAST.

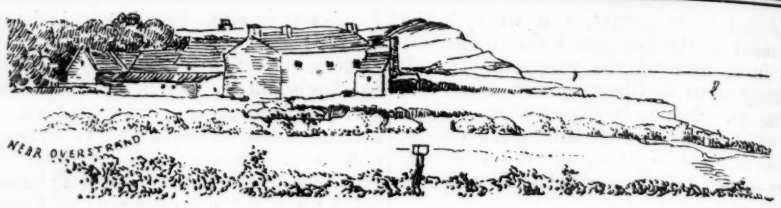
WHEN Mr. John Knightley was so indignant with the Highbury apothecary for presuming to think that he ought to have taken his family to Cromer instead of to Southend for their health,* he did not dispute the sanitary superiority of Cromer. It was the question of the expense and trouble of moving a whole family so long a distance in coaching days, which he thought he understood better than Mr. Perry. It appears from the episode, that Cromer was in Jane Austen's day a recognised superior watering-place, a proper place to go to if you could afford it. For a long time since then it seems to have been quiescent, remaining until very recent years beyond the limit of the railway system; now railway extension has brought it within reach of excursionists, while at the same time the temporary residence of royalty,—foreign royalty, it is true, but still royalty,—has sanctified it in the eyes of society, and during this autumn Cromer has been another "London-by-the-Sea," swarming with visitors, and its sands covered with cricket and lawn-tennis players. This over-populous condition, which we had not realised from report, would hardly have been an extra attraction. But the fates were kind to us: Cromer was "full up," as the tramcar conductors phrase it, but we could find accommodation at Overstrand, a couple of miles eastward along the coast.

Now, Overstrand turned out to be an ideal place for a seaside holiday. A splendid beach; no promenade or pier or any such mundane vanities, a few visitors dotted about, and a small native population of fishermen, frank-spoken courteous fellows, whose boats formed one element in the picturesque of the scene. The accepted type of boat in this part of the coast has a marked character of its own. As will be seen from the subjoined sketch, it has

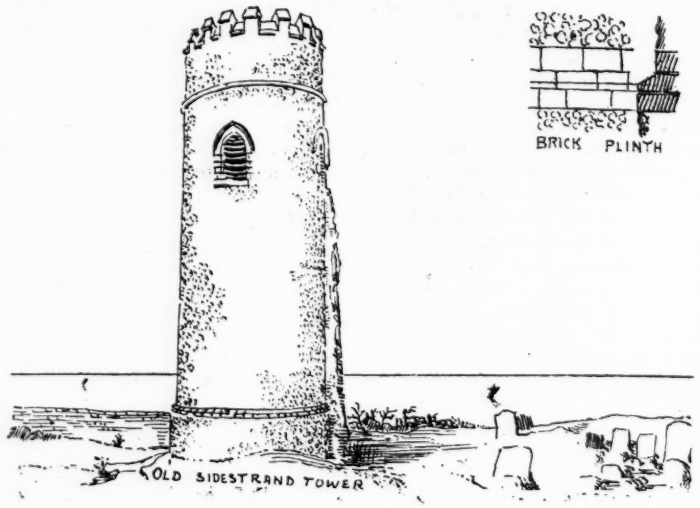


not the usual square stern, but is sharp at both ends, the object being, we were told, to render them more manageable in beaching in rough weather, the sharp stern not being so liable to be kicked up by the surf when approaching the beach. The rowlocks, too, consisting of circular holes through which the oars are drawn, are quite peculiar to this part of the coast. They are capital little craft, keeping wonderfully dry on a breezy day, and will stand a great deal of rough weather. The method of shaping the upper planks, narrow at the ends and widening in the centre, is duly emphasised with true artistic propriety in the painting of the boats; generally the top plank is red or blue, the next white, which gives a marked character, quite distinct from the commonplace narrow stripe of uniform width with which boats are usually decorated. The method of conveying the boats up the beach after landing is a characteristic incident of the place; the straight, heavy, sea-oars (so different from the river type of oar) are passed through the circular rowlocks so as to project on each side of the boats, and six strong fellows in sou'-westers and big boots march up in step, three on each side, carrying the boat between them by the oars; and if Mr. J. C. Hook wants a new foreground group for one of his pictures he will not easily find a better or more picturesque one than this.

The coast here, on the round shoulder that juts out eastward of the Wash, looks nearly north, and looking out from the beach, there is nothing but sea water between us and the North Pole, a fact with which the keen sharp air of the landward breeze is quite in harmony. The shore lies beneath high cliffs with an undulating skyline, composed of soft clayey strata, which have been for centuries gradually going into the sea. The coast line is now the section of what were once undulating downs falling in



long slopes to the sea; at present, between Overstrand and Cromer especially, the slope is upwards towards the sea, as will be seen from the sketch, "Near Overstrand," looking along the coast towards Cromer. The wave of the land, so to speak, sweeps upwards, but has been cut off just at the crest; one can almost see in imagination the continuing lines of the contours



as they once were. So great has been the advance of the sea, or rather the wearing down of the land by its action, that the site of the township of Shipden, under which Cromer was formerly included, has gone under the sea since the making of Domesday Book. Remains of the church of Shipden were formerly to be seen above water, off Cromer at low tide; and

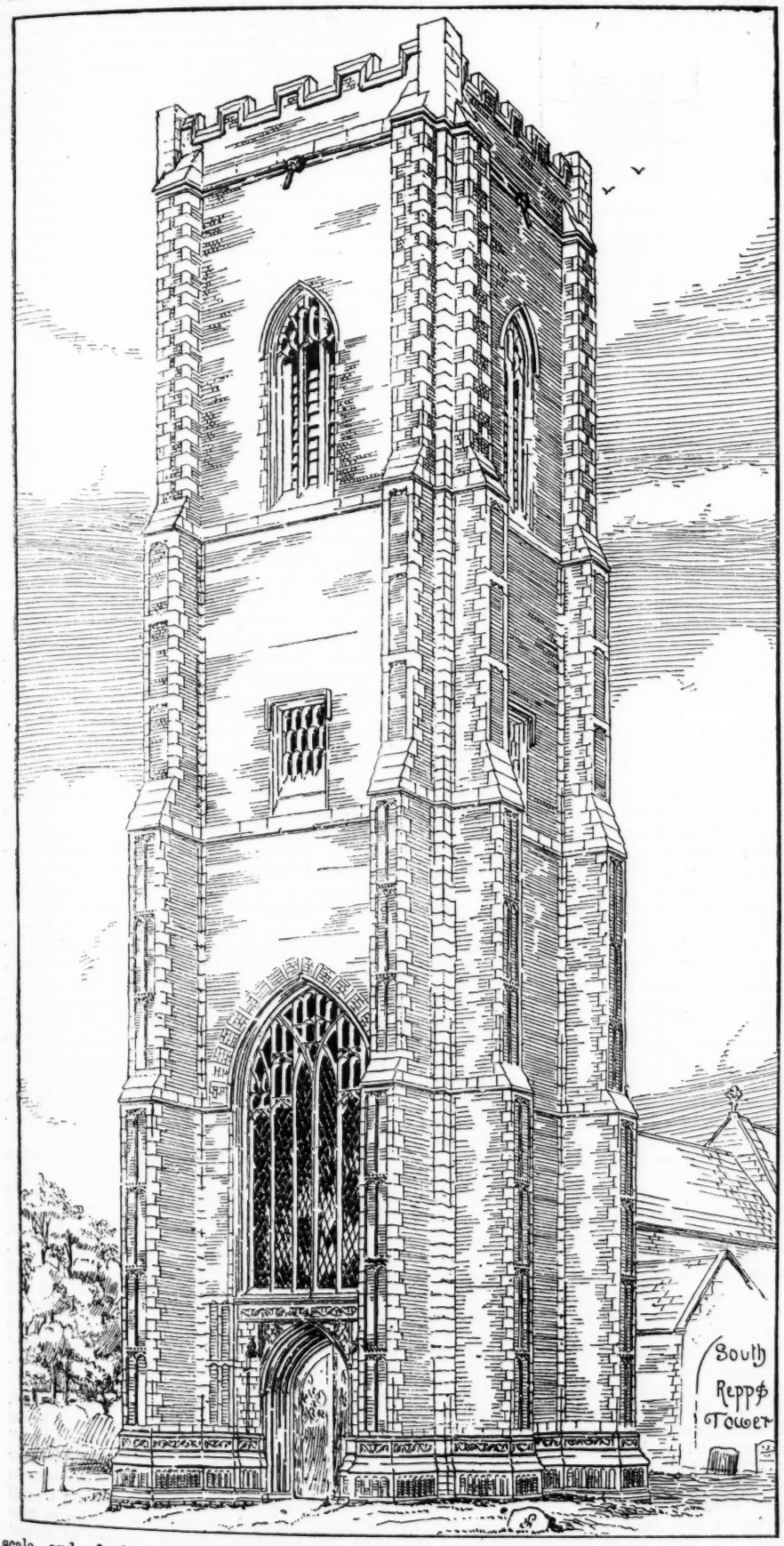
were known as the Church Rocks. A Cromer fisherman informed us that last year they, for the first time, remained invisible at all states of the tide: so the church under the sea must be suffering further disestablishment. An example of the practical influence in the neighbourhood of this fragility of the coast line is shown in the old churchyard at Sidestrand, about a mile from Overstrand. On first seeing this ruined tower, shown in the sketch, in the middle of a deserted graveyard, we supposed it to have been long ago dismantled, but the dates on the gravestones read as late as to 1854. On inquiry, we learned that the people were so much afraid of a landslip and of the church, about forty yards from the edge of the cliff, coming down suddenly some day, that they declined coming to church, and the church was accordingly pulled down and the materials used towards the erection of a new one at a safe distance inland, the tower being left as a landmark for the fishermen. So there it stands amid the forgotten gravestones, the centre of a curiously melancholy scene. The round tower is of a type that is found here and there about the country, but only in very small churches (this tower is, perhaps, 35 ft. high); the form was evidently adopted, in these cases, for economy, to avoid the quoin-work at the angles necessary in building with flint pebbles, the staple walling material of the district.

It is a beautiful walk from Overstrand to Cromer over the high undulating downs, their margins relieved, on a fine day, against a deep-blue expanse of sea. Among the natural incidents of the neighbourhood is the abundance of poppies, which grow everywhere in profusion. One part of the downs close to Overstrand was glorious with wild vegetation of all colours, but the scarlet masses of poppies predominating; and it was curious to notice that on grey days, when there was no direct sunlight, the poppies seemed more vivid than usual, their strong colour requiring no help from sunlight, while the other vegetation retired into neutral tints. On the margin of the cliffs, when the wind blew off the land, the swallows indulged in a little pastime, which we found quite as interesting as they did. They flew about in numbers under the lee of the cliffs to get shelter from the wind, but every now and then one would mount up above the cliff edges make a pretence for a moment of beating against the wind, and then stiffen its wings and enjoy the luxury of being fairly blown away with a sweep to leeward. It was evidently a recognised and popular sport in the swallow world, and a very pretty little spectacle it made.

Cromer as it was,—old Cromer,—is getting pretty well extinguished amid the new streets and houses growing up around the old town. The old portion is curious and characteristic; narrow-winding streets without footwalks, which a modern omnibus fills up as the giant and his horse fill up the street of the old French town in Doré's illustrations to Rabelais. The new houses are mostly in the accepted manner of the district for domestic architecture: flint walling with brick or stone dressings, and are in general in good taste. The only noticeable building is the church: a large Late Gothic church, very solidly built (apparently) of flint with stone dressings, howbeit the chancel seems to have fallen into ruins at some period, leaving only

* *Vide* Jane Austen's "Emma."

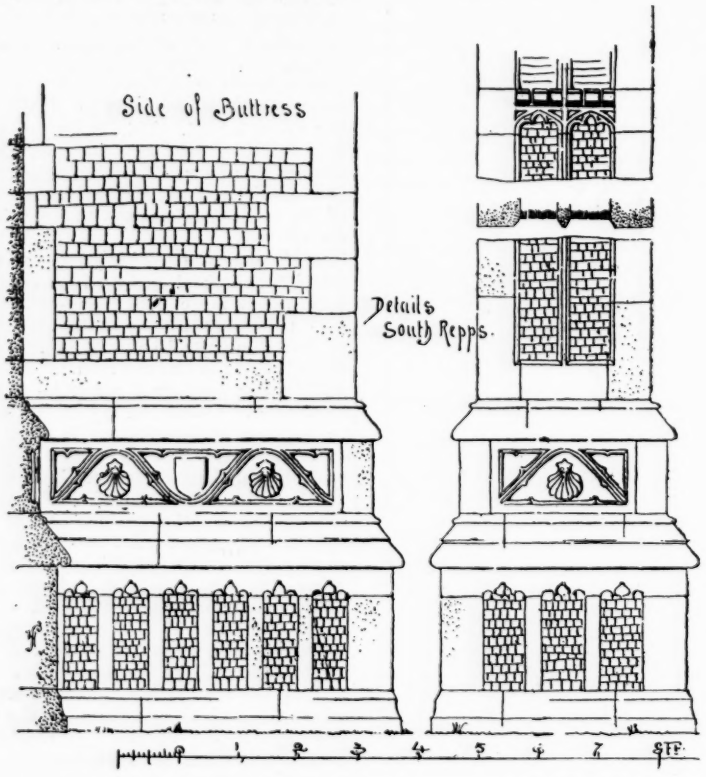
the flint rubble core of one pier standing. The chancel is just now being rebuilt, the core of the old pier being incorporated in the new work,—a proceeding of rather doubtful utility. No workman we spoke to on the building could tell us who was the architect directing the work, so sublime is the indifference of the building artisan on that point. The tower is a fine solid piece of work, on a considerable scale, and of the usual type of the larger towers of the district. We may give an illustration of it on another occasion. Internally, the nave is spacious and lofty, but somewhat bare and cold-looking; there are one or two small but interesting bits of brass in the floor. Westwards of the old town is quite a new district, and a new local line of railway has just been opened in that direction, one idea in connexion with which is that a new seaside "neighbourhood" may be achieved at and about Runton, two or three miles from Cromer. The traffic must be limited at present, since in offering a shilling at the Runton booking-office for a 6d. ticket back to Cromer, we were unable to get change without a special appeal to the station-master. Cromer, however, if things go on as they are, must soon overflow into neighbouring localities, and we fear our unsophisticated Overstrand will not long retain its simplicity. One or two small rows of villas and shops (the latter as yet untenanted) look ominous of change already; the supremacy of the one shop in the place kept by "——, ropemaker and grocer" (that was the combination), will be contested; and the new villas will cut out the lodgings where, as at other great houses, such as Blenheim and Hampton Court, all the rooms opened one out of another, and where, among other waifs and strays of the past, we came on odd bits of silver such as the two spoons (history unknown) figuring here, and which seemed curious and pretty enough for illustration.



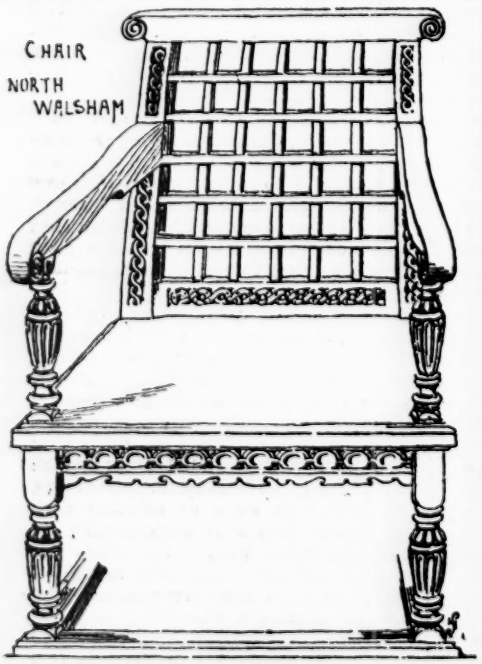
Architecturally speaking, we are in the region of flint building; but there are more ways than one of building flint walls. The employment of the wrong way, in a good many instances, has led to unhappy results, which have left their record behind. The wrong way is to build walls of rounded flints stuck into mortar of doubtful consistency, after the fashion of raisins in a plum-pudding, and with no through bond of any kind. The results are dramatically indicated in the remains of what was probably once the very fine, certainly very large and massive, tower of North Walsham, a few miles inland. This came down by the run fifty or sixty years ago, the west wall and half the north and south walls going, and leaving the remainder a gap-toothed ruin. The section of the walls thus exposed to view shows plainly enough why they fell; much more plainly, indeed, than it explains how they managed to stand for the best part of four centuries. The wall was a mere pebble-and-mortar pudding. But evidences of the same state of things appeared nearer to our doors. For, at Overstrand, there is but the ruin of the old church, and the new one, not many years old, is built close to it. Under the ivy of the old ruins are to be seen evidences that it was, on a small scale, a rather fine specimen of flint walling with inlaid decorative arcades and other like adornments. The church has two periods of history. First the eastern half of it got into such a crazy state, that, two hundred years or so after its foundation, this portion of the church was abandoned, and in the "churchwarden era" a cross wall was built cutting off and enclosing the western half of the church; the north and south entrance doors (for there were both) were built up as far as the springing of the arches, leaving the rest of the openings as triangular windows, and this portion of the edifice was accepted as the church. In recent times this portion also has become dilapidated, and the tower (still standing, and containing some good bits of detail) is said to be unsafe, and the new church, a prim little modern Gothic edifice, was built in the same precinct. This is not a very out-of-the-way history in itself; but it does rather strike one when one finds history repeating itself in other parishes on just the same lines. For instance, at Mundesley, five or six miles off down the coast, the church is now in the "second stage," as illustrated by the ruins of Overstrand; that is, the eastern portion is ruinous and unroofed, and the western portion kept in repair and used for service. At Antingham, again, a few miles inland, we noticed the same phenomenon of a ruined church standing close to a later one in use; the later building in this case seemed to be Late Gothic, and not a modern one; but we sighted it, to say truth, on the return portion of a twenty-mile walk, and in pouring rain, and considerations of time and the elements interfered with closer survey. But one carries away a general impression that the Norfolk coast is a region where a good many things are going to pieces, including the coast itself.

Among things, however, that show no sign of going to pieces, is the largest church-tower in the neighbourhood of which we are speaking, the grand and massive tower of South Repps, of which we have given a tolerably careful sketch. The rest of the church, externally, is uninteresting, and promised so little that we did not waste time by going inside: the tower is the great attraction. There are, as we observed, two ways of building with flints, and South Repps is emphatically an example of the *other* way. The flints are mostly squared and coursed (the labour of doing this must have been very great), the external and re-entering angles solidly built up in stone,—in the re-entering angles of the buttresses all the stones are worked in one solid piece for the two faces, leaving no joint at the angle; and such buttresses! such solid rock-like masses of walling, as it really does one good to see. The decorative details of the tower, as will be seen, are few and simple, but they are in the most refined taste,—not a touch of gimcrack anywhere, and worked out throughout in the most conscientious manner. The square traceried light in the middle stage of the tower is a very general feature in the towers of this district; it occurs in the same way at Cromer and Worstead, and other large towers; and even in so small a church as the

interesting little one at Erpingham, with its little sanctus bell-cot, the square light in the tower is not forgotten, though there it is reduced to a mere little port-hole with a single quatrefoil in it. The large west window at South Repps is of a remarkable and, as far as we are aware, unique design, in some of its points. Unfortunately, it is in reality in a very unhappy state, being almost entirely built up between the tracery (this was in that blessed



"churchwarden era," no doubt!) and cemented over, nearly half the tracery being broken out; but as the complete design of one side of the window remains projecting beyond the cemented face, we have ventured to restore it in the sketch. (The "Anti-scrape Society" no doubt would like to keep it as it is, as "an interesting memorial of the taste and feeling of our forefathers.") In all probability the angle terminations of the tower either once had, or were



intended to have, crocketed pinnacles, like those of its neighbours at Cromer and Worstead; but we cannot help feeling that it is better without them; they would have spoiled the massive character of the whole. As a matter of proportion, the tower is perhaps a little too high for its width, or too narrow for its height; but it is a monument of fine and conscientious mason's work. At the turn of the road opposite the churchyard is what modern taste would call a charming example of a Queen Anne red brick dwelling-house; but it looks a little prim in that neighbourhood, and somehow the grand old tower seems rather to scorn it.

North Repps Church is a much smaller structure, remarkable mainly for the excellent workmanship of its walls. Trunch Church, the roof of which we have all admired in "Brandon's Open Timber Roofs" and similar illustrative books, is within a walk of Overstrand, and the roof, with its pierced-work spandrels, seems in wonderfully good preservation. The other lion of the church is the elaborate and rich late font-cover, of which the upper portion is much departed, but it must have been a fine and rich piece of work of its date. The church itself is disappointingly small in comparison with its repute, and not of much interest in its masonic details; there is a remarkably well-moulded doorway in the south wall of the chancel, which is in "the books." Knapton, a mile or two further on, with its famous roof, is also remarkably unattractive externally and as a building.

Among the larger churches of the immediate neighbourhood we are speaking of, Worstead and North Walsham are prominent. The latter, to the catastrophe of whose tower we have already referred, is poor externally, though big; but internally it is a very fine church, large and spacious, and with a fine though late arcade. Among special objects of interest in the church are some painted panels once forming portions of a reredos, or of the rood-loft, and some remarkably fine pieces of carving, also probably parts of an old rood-loft, which are at present hidden out of sight at the back of some seats at the west end. The chancel contains an exceedingly fine Renaissance tomb to one of the Pastons (of the family of the "Paston Letters"), of which we will give a drawing shortly, and a capital Renaissance chair is preserved in the vestry, of which a sketch is subjoined. A couple of large and exceedingly vigorous grotesque spout-heads, which once formed part of the ornaments of the tower, are also preserved in the church.

Worstead Church is of the same large and spacious type in the interior, and with a fine and well-preserved hammerbeam roof, which, however, has been bedevilled over lately with a coat of paint of an odious livid flesh-colour, apparently with the object of making the church lighter. Whoever did it may congratulate themselves on having gone far to destroy the dignity and impressiveness of the interior. There is a rood-loft *in situ*, but very much restored and patched up, containing panels painted with figures after the same manner as those to be seen at North Walsham. There is a considerable amount of inlay decoration in stone and flint on the exterior of this church; arcading and quatrefoils, &c., from some of which latter, by the way, the flints have fallen out, having been too superficially inserted. In general, however, the exterior masonry is firm and solid, and the tower is a good one, but rather spoiled by its disproportionately high crocketed pinnacles.

It was impossible to be in the neighbourhood without a look once more at Norwich, dropping down by train over the level country, about which glide slowly the large sails of boats, floating on water mostly invisible from the railway, in a curious ghostly fashion. Norwich is not one of the largest or one of the most beautiful of our cathedrals, but it is certainly one of the most interesting, and reminds one again how remarkably various our cathedrals really are, in spite of similarity of general scheme and of certain classes of details. If the builders of modern Gothic churches had tried a little more of that kind of variety (even while keeping to pure orthodoxy of detail), they would have made a better thing of it. Looking at the apsidal end, with its flying buttresses, from the roof of the north transept, it occurred to us that possibly no one had sketched it from this point before. So, there it is,* for what it is worth. We saw something else too, which we could not sketch, but the mention of which is not to be pretermitted. While "prospecting," as the Americans say, on the roof, a thunderstorm of the first order got up, passing away to the northward a little clear of the cathedral. Overhead came an enormous pile of thundercloud, as black as ink, except for those curls of white vapour which often accompany a cloud of this kind, and, as one may say, intensify its expression; against the cloud the cathedral spire, which seemed to go right up into it, actually glittered; below was the mass of trees in the Close all waving in the storm; to the north were constant flashes of lightning (we saw four separate silver streaks shake perpendicularly downward in the space of a second or two), and to the east a patch of clear bright sky, just by way of adding intensity by contrast. It was a Turner picture of the grandest type, with sound and movement added. It is not every day one sees a thunderstorm from the top of a cathedral; but it is well worth seeing when you do.

SANITARY EXHIBITION AT BOLTON.

THE Health Exhibition which was opened on Tuesday afternoon in the fine Drill Hall in Silverwell-street, Bolton, in connexion with the Tenth Autumn Congress of the Sanitary Institute of Great Britain, is, if not quite so large as some of its forerunners, a fairly good and typical Exhibition, and the citizens of Bolton and the neighbouring towns may find in it specimens of most of the best sanitary appliances and materials now before the public, as well as exemplifications of the best methods of fitting and construction. Like preceding Exhibitions under the auspices of the Sanitary Institute, and *un*like others too numerous to mention, the Exhibition was ready by the time appointed for the opening ceremony,—a result partly due to the requirements of the judges, and partly to the labours of the Curator, Mr. E. L. Box.

The Exhibition is divided into five classes, viz., Class I., Building Materials, Machinery, and Construction; Class II., Water Supply and Sewerage; Class III., Heating, Lighting and Ventilation; Class IV., Personal Hygiene, Foods, and Disinfectants; and Class V., Miscellaneous. Each of these classes is subdivided into a number of sections, but inasmuch as a great many of the exhibitors have goods on exhibition coming under several sections, we will, to save needless repetition of exhibitors' names, proceed to notice the exhibits stall-by-stall so far as may be necessary.

At Stall No. 1 Messrs. Manlove, Alliott, Fryer, & Co., of Nottingham, exhibit a model of Fryer's furnace, known as the "Destructor," for burning town refuse. This model and other models and drawings of kindred apparatus in the Exhibition, to be hereafter referred to, will be looked at and compared with interest now that the question of the disposal of towns' refuse is becoming, in more than one sense, a "burning" one in many localities. The subject was recently treated of by Mr. Charles Jones, the Surveyor to the Local Board of Ealing, in a paper read before the Association of Municipal and Sanitary Engineers and Surveyors, a summary of which appeared in the *Builder* a fortnight ago, and of the discussion on which we give a report this week. The same exhibitors

* See lithograph in this week's issue.

show, amongst other things, one of Washington Lyon's admirable steam disinfectors.

Stall No. 2 is that of the Lumley Brick Company, Fence Houses, Durham, who exhibit some very good white and coloured enamelled bricks, together with fireclay goods. At Stall No. 3, Mr. R. de Soldenhoff, of Cardiff, exhibits a drawing showing the construction of his patented "Incinerating Sludge Furnaces," to be used in conjunction with the operation of coking,—*i.e.*, coke-making. The patentee locates his incinerating furnaces between coke ovens. In a small pamphlet which has been printed by the exhibitor, he gives the following results as having been obtained during fifteen weeks' work with two furnaces, each 14 ft. long, at Leyton:—Weekly average weight of wet sludge put into the two furnaces, 25 tons 6 cwt.; weekly average weight of ash taken out of the furnaces, 4 tons 17 cwt. 0 qr. 20 lb.; weekly average weight of coal used, 7 tons 11 cwt.; weekly average weight of coke obtained, 5 tons 1 cwt. We cannot here enter further into detail about these furnaces, but they appear to be worth attention. Whether their operation is productive of any nuisance we do not know. What do the Leyton people say?

Mr. James Gregson, of Bolton, Stall No. 4, shows a very good arrangement for fixing rain-water and other pipes to walls, so as to permit of the ready renewal of a single length. The pipe is kept well away from the wall, and the ears or lugs are provided with slots of a reversed key-hole shape,—*i. e.*, having a circular hole, with a vertical slit opening from the top part of the hole. Each length of pipe is suspended on large flange-headed galvanised iron nails, the heads of which are admitted through the circular part of the "keyhole," the pipe then dropping down to the extent of the length of the vertical slit referred to, which admits the stem of the nail, securely holding the pipe in position. The lugs or ears are attached to the socket at the top of each length of pipe, and while the socket is two or three times as deep as the sockets of the common rain-water pipes, the spigot end of the length of pipe above only drops half-way down into the socket, thus leaving more than sufficient play or power of telescoping between each length of pipe to allow not only of any length being readily lifted out and replaced, but to permit of the ready fixing of the lengths whatever may be the irregularities in the courses of brickwork. The lugs or ears can be readily applied to the ordinary rain-water pipes, thus keeping them away from the walls, though without affording the vertical play which is given by the deep sockets of Mr. Gregson's patent pipes.

At Stall No. 5 Messrs. James Richmond & Co., of Burnley, exhibit a model of the "Nelson" town-refuse destroyer. Close by is shown a model of T. & T. Vicars's improved self-acting smokeless furnaces, for the use of which there is great scope in Manchester and the surrounding districts.

Messrs. Doulton & Co., of Lambeth (Stall 27), have a very good display of sanitary appliances and materials, besides their "Peto" fireproof flooring, which was fully described and illustrated by us on the occasion of the Leicester Exhibition, two years ago.* It is a method of flooring which is well worthy of the attention of architects, and we are able to announce that it is to be used throughout in the rebuilding of Mr. William Whiteley's recently-destroyed premises in Westbourne Grove. We think it probable that if, unhappily, future fires break out in the premises now being rebuilt, they will, by the aid of this system of construction (coupled with precautionary measures as to the situation of staircases and lift-shafts), be confined to one floor,—supposing that incendiaries have not free scope to fire more than one floor at a time; for simultaneous outbreaks of fire due to accident alone are very unlikely to occur. Messrs. Doulton also exhibit their patent safety house drainage pipes, which are made in extra long lengths of 3 ft., thus diminishing the number of joints. These pipes are made of the best stoneware, with a highly-enamelled surface both inside and outside, and are connected together by their patent self-adjusting joint, which we fully described and illustrated last year in our account of the Sanitary Exhibition at York.† This joint, while being self-adjusting and flexible, is perfectly watertight, and has been found very valuable and helpful in laying drain-pipes in wet ground, as at Acton and elsewhere. Messrs. Doulton exhibit the application of these pipes, thus jointed, as soil-pipes, so that stoneware may be used throughout a building for closets, traps, soil-pipes, and drains, thus avoiding difficulties and objections to the jointing of metal and stoneware. The elasticity in the joints to which we have referred allows of settlements or deflections in the lines of piping,—whether used horizontally as house-drains, or vertically as soil-pipes,—without the joints ceasing to be air-tight or water-tight. Those who have not already made themselves acquainted with this system of jointing (in which no cement is used) should do so, as it promises to effect quite a revolution in drainage work. Another useful sanitary appliance shown by these exhibitors is Hellyer's patent "Anti-D" trap made in stoneware.

Exigencies of space compel us to break off here, but we will next week conclude our account of the most notable appliances and materials in the Exhibition, which will remain open until and inclusive of Saturday, October 15th.

* See *Builder*, Sept. 16, 1885, p. 416, and Dec. 19, same year, p. 877.

† See *Builder*, Oct. 2 and 9, 1886, pp. 481, 539.

The report of the judges of the Exhibition made the following among other awards and recommendations:—

Medals and Special Certificates.

Bennis, E., Bolton.—Smoke-Preventing Stoker and Cannel Furnace.
Lovibond, J. W., Salisbury.—Tintometer.
*Constantine Bros., Bolton. — Dr. Jaeger's Sanitary Clothing.
*Heap's Dry Closet Company.—Dry Earth Closet without Separator.
*Doulton & Co., Lambeth.—Peto Flooring.
*Manlove, Alliott, Fryer, & Co., Nottingham.—Washington Lyon's Steam Disinfector.
*Greenall & Co., Manchester.—Steam Washer.
*Doulton & Co., Lambeth.—Self-adjusting Joint for Stoneware Pipes.
*Morrell's Sanitary Company, Manchester.—Morrell's Cinder-Sifting Ash Closet.
*White, W. P., & Co., London.—Nicholl's Soot and Salt Closet.

Certificates of Merit.

Haslam, J., Bolton.—Hand Fire Extincteur.
Maritime and General Improvement Company, London.—Loeb's Respirators.
Gregson, J., Bolton.—Removable Rain-water Pipe.
Vause, J., & Son, Bolton.—Shanks' Reliable Water-waste Preventer; Craig's White Enamelled Sinks; Rufford's Enamelled Fire-Clay Bath; Shanks' Imperial Lavatory; Shanks' Wash-Out Closet and Cistern combined, for country use; Shanks' Tubal Wash-Out Closet; Shanks' Urinal with Tilting Flusher; Cast-Iron Smooth-bore Drain Pipes and Fittings.
Cuerden, R., Bolton.—Shanks' Reliable Water-waste Preventer; Shanks' Imperial Lavatory; Morrison's Spray Lavatory; Shanks' Tubal Wash-Out Closet.
Hembry & Co., Manchester.—Through Colour Linoleum.
Maritime and General Improvement Company, London.—Portable Electric Glow Lamp.
Control Air Propeller Company, Bolton.—Humidifier and Air Inlet.
Morrell's Sanitary Company, Manchester.—Cinder-Sifting Dust-bin.
Doulton & Co., Lambeth.—Stoneware Safety Pipes, in long lengths.
Parkinson, Sweaney, & Co., Manchester.—Air-tight Soil-Pail, with Slide Catch.
Robertshaw, J., Manchester.—Laws' Pathway Rubbish-Receiver.

Exhibits Selected for further Practical Trial.

With regard to the following [among other] exhibits, the Judges are unable to give their decision until they have submitted the exhibits to a more complete and extended practical examination than is possible before the opening of the Exhibition:—

Doulton & Co., Lambeth.—Improved Siphon Flush Tank.
Vicars, T. & T., Liverpool.—Mechanical Stoker.
Milton Syer, London.—Siphon Waste Preventers, Nos. 1 and 2.
De Soldenhoff, R., Cardiff.—Incinerating Sludge Furnaces.
International Water and Sewage Purification Company.—Systems of Water and Sewage Purification.
Begg, G., Bolton.—Chamberland-Pasteur Filter; Slack & Brownlow's Filter.
International Water and Sewage Purification Company.—Aromatic Disinfecting Powder and Liquid.
Calvert, F. C., & Co., Manchester.—Soluble 70 per cent. Carbolic Acid.
Kirkham, J. W., Bolton.—Blackman Air-Propeller.
Control Air-Propeller Company, Bolton.—Air-Propeller.
Wood, E., Manchester.—Air-Propeller.
Rothwell, J., Farnworth.—Air-Propeller.
Æolus Waterspray Company, London.—Keidel's Hydro-Ventilator.
Maignen, P. A., London.—High-pressure Filter; Water-Softening Process.
Lakin, R., Manchester.—Compound Carbolic Powder and Soluble Creosol.
Manlove, Alliott, Fryer, & Co., Nottingham.—Fryer's Destructor, Johnston's Dryer, Firman's Dryer.
Wood, E., Manchester.—Exhaust Outlet Ventilator.
Kite, C., & Co., London.—Turret Ventilator, and Counterpoise Chimney-breast Ventilator.
Cuerden, R., Bolton.—Hale's Ventilator, Banner's Rotating Ventilator, Banner's Inlet Ventilator; Chromite Disinfectant.
Houghton, J., Liverpool.—Eureka Chimney-cowl.
Rothwell, J., Farnworth.—Revolving Screw Combination Ventilator.
Æolus Waterspray Company, London.—Stafford's Ventilator, Pollock's Downcast Ship Ventilator.
International Paint Company, London.—Sanitary Magnetic Fire-proof Paint.
Macpherson, D., & Co., Manchester.—Foochow Enamel.
Bolton Paint Company, Bolton.—Oxide Paints.
Asbestos Fire-proof Paint Company, Manchester.—Asbestos Fire-proof Paint.
White, W. P., & Co., London.—Soot and Salt Urinal.
Doulton & Co., Lambeth.—Anti-D Stoneware Trap.
Hargreaves & Bardsley, Oldham.—Eclipse Gas Governor
Stott & Co., Manchester.—Combined Gas Governor and Cut-off Valve.
Fourness, H., & Co., Manchester.—Regenerative Gas Lamp.
Æolus Waterspray Company.—Capell's Fan.

The following exhibit, which has gained a certificate, is deferred in competition for the award of a medal:—

Galloway, J., Bolton.—Lightning Fire Extincteur.

The following, which have gained medals and starred certificates at previous Exhibitions, are now so well known and their merits are so fully appreciated, that the Judges do not think it necessary to make any further award to them:—

Moule's Earth-Closet Company.—Moule's Earth-Closet.
Calvert & Co., Manchester.—Pure Carbolic Acid.
Cuerden, R. Bolton.—Potts' Edinburgh Sewer-Trap.
Vause, J., & Son, Bolton.—Buchan's Disconnecting Trap and Access Pipe.

The report is signed by the judges, viz.:—Mr. Rogers Field, B.A., M.Inst. C.E. (Chairman); Mr. A. Wynter Blyth, M.R.C.S.; Mr. W. Eassie, C.E.; Mr. Henry Law, M.Inst. C.E.; Mr. J. Wallace Peggs, A.M.Inst. C.E.; Mr. H. Saxon Snell, F.R.I.B.A.; Mr. Ernest Turner, F.R.I.B.A.; and Dr. Louis Parkes, Secretary.

* Exhibits which have already received medals at the previous Exhibitions of the Institute are excluded from Awards of Medals, but those exhibits to which a second medal would otherwise be awarded receive special certificates, and these are distinguished in the list by asterisks.

ARCHITECTURAL ASSOCIATION VISITS.

THE Architectural Association, on Saturday, the 17th inst., made a vacation visit to Minley Manor, near Farnborough, the residence of Mr. Currie. The original house was designed by Mr. Clutton, and is a florid example of Gothic treatment, with a good deal of French feeling. The present additions are from the designs of Messrs. Devey & Williams, and comprise, in addition to extensive remodelling in the interior of the house, a chapel, kitchen, offices, stables, orangery, and entrance-court. The chapel is built with square random Kentish rag, dressed to quite a smooth face, and worked with a very fine joint. The upper part of the wall has squared flint panels. The chapel is surrounded with a cloister. The dining-room is panelled with wood, treated in the Renaissance style, with a very rich wooden mantelpiece, and at the end of the dining-room is a smoking-room, with oak panelling in character with Mr. Clutton's detail. The staircase, which is arranged around a thick wall, is hung with French tapestry. There is also some good French ironwork in the house.

The afternoon was devoted to a visit to Bramshill House, Hampshire, the residence of Sir William Cope.

The present house was built by Edward, Lord Zouche, 1605 to 1612, which latter date is on some of the ornamental stack-pipe heads, with the initials E. Z. (Edward Zouche), from the designs of John Thorpe. The house is supposed to be built on some of the foundations of an older house, built by Thomas Foxley, who was a contemporary of William of Wykeham. This older house was probably built round a courtyard 100 ft. by 80 ft., and Thorpe almost filled up this inner space, there being only a narrow well some 12 ft. wide left in the centre of the house. There is a tradition that the house was intended to be purchased for the residence of Henry, Prince of Wales, the eldest son of James I., and the ornament over the oriel window in the principal front is thought to be the three feathers of his crest.

The house is built of red brick and Headington stone. Many of the mullions, however, are of brick and plastered.

The entrance-hall has a fine screen, decorated with shields, on which are painted the arms of the Cope family, and at the upper end of the hall is a dais. From this end a staircase is reached, and, passing beyond the staircase, are three rooms, used as dining-room, drawing and billiard-room. The staircase is an oak staircase that was brought from Eversley Manor by the present owner. On the first floor to the left is a splendid drawing-room with an elaborate plaster ceiling, having a double pattern with pendants. The mantelpiece is a very pure Italian Renaissance design in two stories, the lower Doric, the upper Ionic, in red and white marble, the hearth having a red and white

marble pattern similar to the mantelpiece, and the dog-irons and grate are evidently of contemporary design. The tapestry in this room is from designs by Rubens. The next room has a fine plaster ceiling of rather simpler pattern and good chimney-piece; beyond this is the long gallery, which extends the whole depth of the house. This room is panelled with dealbolection moulded panelling, and contains an interesting collection of curios of all sorts. The legend of the mistletoe bough used by Haines Bailey and Rogers, is associated with this house, but Sir William Cope stated that no bride in the family had ever died on the day of her marriage, and the only way he can account for the origin of the legend was that an ancestor who lived in Italy a long time probably bought a chest in which an Italian lady is said to have died under circumstances somewhat similar to the ballad. This chest, of which a photograph was shown, is not at present in the house. The Morgan family at Newport, Monmouth, also claim this legend, and show what purports to be the original chest. To the right of the staircase is the drawing-room over the hall, a charming room with the circular bay over the entrance, from which a fine view is obtained. The ceiling in this room is elaborately wrought. Opening out of this room through a four centred arch is the chapel, which is quite a museum, and contains a fine piece of tapestry dated as early as 1450. But the principal feature of the house is the terrace, which measures 194 ft. in length, and has at either end a double-arched summer-house. All the pictures of this restore the balustrade, but Sir William, who has had the coping carefully examined, is of the opinion that the short pieces at either end are all that ever existed. The time allowed was all too brief to do justice to the house, and the host gave a cordial invitation to pay another visit next year.

PROFESSOR T. HAYTER LEWIS ON THE LAYING-OUT OF TOWN AREAS.*

SANITARY INSTITUTE OF GREAT BRITAIN.

IN availing myself of the privilege of addressing the members of this Congress in this active and stirring town, which is spreading itself out in every direction, I have thought it well to bring before them a subject of great interest, but which has not been hitherto much discussed, viz., the extension of our great cities and the erection of new ones; and to suggest such a course as would ensure that such requirements as are now considered to be necessary for their healthful occupation may be provided for at the outset.

Of the conditions to be noted in selecting a site for a new city, we have descriptions by writers of all ages, from Vitruvius in the first century, to Dr. Parkes in his well-known work of our own time. But this is a subject too large for a short address, and it is of the extensions only that I wish now to speak. They have, almost invariably, been carried out by speculators without any general definite guiding plan, with little or no forethought for future extension, and with slight provision for supplying the inevitable future wants of the inhabitants. Thus, in course of time, spaces have to be cleared out for churches, schools, institutes, baths, and such like edifices as are now required for a large population, and clearances have to be made to allow for its free breathing. The extension of the cities takes place in different directions and from different motives.

The well-to-do citizens leave their smoky town and confined houses to form new suburbs, where they may breathe freely in their open gardens.

The artisans cluster together at first for cheapness and for nearness to their work. Then comes over-crowding and then Sanitary Acts, and then suddenly the neighbouring fields are invaded, and acres of ground are covered with new small houses, put up as a speculation in the cheapest way, with just so much breathing-space as the local by-laws (if there be any) will allow.

Now if this be the time of activity in building new towns and extending old ones, it is also pre-eminently the time of activity and power in corporate bodies. From Town Councils to Vestries, from Trade Guilds to Trade Unions, from companies formed for their own benefit and companies formed (all honour be to them) for the benefit of their fellow-citizens,—an active part is being taken in public work.

New and extensive powers are being acquired and exercised by Corporations for the sewage, the supply of water* and of gas, for providing open spaces, regulating the width of streets, and even the height of rooms and size of windows. Your own by-laws are sufficient evidence of this.

Now I simply wish to extend these powers. I wish that when it may appear evident to a Corporation that any district will require before long a large accession of houses for a population which is clearly increasing to an overflow, such Corporation shall have the powers (and I think that public opinion will require it to exercise them) to acquire control over the requisite land,—to formulate a general plan, giving the width and direction of the streets,—to provide spaces for such public buildings as are certain to be required in a well-regulated community, and for such open spaces as are required for its healthy enjoyment.

My scheme is not a very grand one in any respect; I simply want to provide at first for those requirements which must eventually be provided, which can only be fulfilled at a great cost, and even then imperfectly, if not so provided at first. I do not even suggest that the Corporation should build, but that it should give general guiding directions, leaving the working-out to private persons, or to such companies as have of late done so much good in building dwellings of various classes, from the highest to the lowest.

To show that such powers as I have indicated might well be called into being on behalf of even a high-class district, I might have brought before you the earnest attempt made, some thirty-five years ago,† by the late Professor Cockerell, R.A., to obtain a public control over the proposed buildings at Hampstead, a suburb now covered with houses.

As I was reminded by my friend, Mr. Rogers Field, the Professor drew out a design by which the whole of that suburb might have been built over on one definite plan, utilising the various hills and valleys, so as to take every advantage of its picturesque beauties. Public opinion was not ripe for such a course then, and this grand opportunity was lost.

[Professor Lewis then described, with the aid of a map, a district of London, and the mistakes made in laying it out, and proceeded to point out in detail on another map the manner in which the same district might have been laid out, by forethought, so as to accommodate the same number of persons with more convenience for traffic and with greater attention to provision for healthful and enjoyable life. The details of Professor Lewis's remarks, however, can hardly be intelligibly followed apart from the diagrams, and we proceed to the more general remarks arising out of the subject.]

I now ask you to bear with me whilst I enter, in some detail, as to the public works and buildings for which provision should be made. I assume that, as a matter of course, the sewers, water, and gas supplied, will be provided in the usual way, so I need not detain you as to these.

In the first place, I would set aside a strip of land outside the whole district for the park, which I take for granted would ultimately be required, no matter what the rank of the adjoining houses may be. Its distance from the furthest point would be about that suggested by Mr. Besant, viz., half to three-quarters of a mile. The size which I suggest here is about the same as that of the Hesketh Park at Southport, which is in one of the best parts of the town, and much smaller than the one here. The position of this open space would provide well, also, for the future extension of the town, and would afford the advantages obtained in the same way as, *e.g.*, at Hastings, where the pretty St. Andrew's Gardens, starting from the old town, pass round at the back of the houses, and are continued to St. Leonards, making an admirable belt of free open air and foliage. Neither in this case, nor in that of public buildings, do I propose the work to be undertaken at the first, but only so to arrange, at the first, that the sites shall be so reserved as to be available when required. As to these, I need do no more than mention offices for the local authorities, and the library, reading-room, science and art schools, and other buildings required for the particular locality.

In the arrangement of these public buildings it would be difficult to take a better example than that of Southport, whose Lord-street and Albert-road form one of the prettiest vistas that I know (I trust that Birkdale will pardon me for classing it with its neighbour),—and I use the word "prettiest" advisedly, as I could not, of course, compare it with such grand thoroughfares, each unrivalled in its way, as the High-street of Oxford, or Princes-street at Edinburgh.

At Southport the chief public buildings are located behind a group of trees, and I know of few more pleasing views than that of the spires and turrets of Christ Church, the Presbyterian Church, and the municipal and other buildings, towering above the foliage, whilst between the trees the buildings themselves are picturesquely seen.

Outside the park I should place the infirmary and convalescent home, a position in which they would have free light and air. If any one suggests that such a position would be too public, and lessen the enjoyment of the park, I would refer him to your own infirmary and children's hospital (the latter the gift, I believe, of your townsman, Dr. Chadwick, and his family), and ask him whether, as a simple matter of landscape effect, to say nothing of the value of such an outlook to the patients, he would wish this picturesque building, designed by one of your able townsmen, Mr. Knill Freeman, to be removed. Or, again, think of the charming way, and without the slightest feeling of sadness, in which the promenade at Southport ends with such a building, whilst at two such different places as Manchester and Hastings the Infirmary forms one of their most prominent buildings. Next to your noble Town-hall and the old churches, the most prominent building is, I think, the market. I do not, of course, propose any such grand building as yours for my district. It might be open at the sides, but covered, as at Preston and Blackpool, or be enclosed as here and at Southport, or St. John's at Blackpool. I know that many towns of importance (I may, I think, name Norwich and Cambridge amongst them) have still little more than open and uncovered market-places, healthy-looking and pretty, with fruit, and flowers, and vegetables, on a fine day; but we often have quite other days in our country, and the attempts at covering up and protecting the stalls then turns the market-place into a wretched collection of tumble-down huts,—I had almost said as bad as Fleetwood. If the quarter be chiefly for artisans, public wash-houses will be indispensable, and, in any case, no matter what the class of inhabitants may be, I look upon public baths also as a provision which can scarcely be valued too highly. For these baths and wash-houses I have suggested no definite site, as this would depend so very much on the kind of inhabitants.

Nor have I marked out definitely sites for churches, chapels, or schools. All these are provided for in the district as it exists, and sites would undoubtedly be claimed for and provided, whatever the general plan might be.

I come now to some other details, as to which I may not possibly have your assent. First, as to drinking-fountains. That such small ones as are now commonly seen should be provided, you will doubtless quite approve. There are many excellent examples in most of the towns in these parts, each combining a drinking-fountain with a public lamp, and being really an ornament to the streets. But I want something more than these, as much for the sake of health as for ornaments to the town.

You know well enough that all the water in use for your houses is stored in cisterns; and although in past times these cisterns were looked upon as being worthy to be seen, and so were ornamented in a way which is now the envy and admiration of workmen and artists alike, they are now rough ugly things, stored away out of sight in any convenient closet or loft which will hold them, and for all their owners know of them may be considered as the property of the spiders. You depend upon your plumber to clean them out once a year. Perhaps he does; perhaps he doesn't. You are none the wiser. But imagine what often happens in the houses of a poorer class. I need not go into details, but I say that a good supply of water, pure for drinking, is an element of health which ought to be provided

* From the Address given by Professor T. Hayter Lewis, F.R.I.B.A., as President of Section II., Engineering and Architecture, at the Bolton Congress of the Sanitary Institute.

* Bolton Corporation Waterworks, 1881, and Bolton Corporation Acts, 1872, 1877, and 1882, pp. 8, 26.

† *Vide Builder*, vol. xi. (1853), p. 417.

and that you cannot provide it in a better way than by fountains. These, in what are now called "the Dark Ages," formed some of the chief ornaments of a town, and I see no reason why they should not do so now.

I don't want to bring in such vast bodies of water as were brought through miles of aqueducts into Rome, or such lavish displays as you have seen, *e.g.*, in Paris, or even such things as our fountains in Trafalgar-square. Nearly all these send their waters into the drains.

There are fountains even now in most of our towns,—a very elegant one at Southport, for example; but, again, with all the water running to waste; whereas in some of the most picturesque Mediæval examples, it came out in small useful jets, as I would have them here; and I feel no doubt that, by a skilful arrangement of gas jets, the effects of frost might be prevented, and a great boon thus conferred in winter, on rich and poor alike; whilst, by a skilful design, they could be some of the most pleasing ornaments to the town that could be conceived. And, as part of the water must go to waste, send it to feed a small stream in the park, like the one here or at Hastings.

Another accessory I must mention is that of seats placed at intervals between the trees. I shall, no doubt, have the same objection made to them as to the trees, and my answer would be the same.

Then, to complete my plan, I would have a small open space opposite to each railway station. Now we have to see, before entering into the question of the kind of houses to be provided, how much the plans which I have suggested have trespassed upon the space now occupied.

I have laid out my main roads in very much the same general direction as the present ones, though in less circuitous lines; but I have made them 60 ft. wide instead of 40 ft., and have set apart spaces for public buildings, &c. The smaller streets I have made 40 ft. wide, the width required by the Model By-laws being 36 ft. The space which I have assigned to the park need not be taken into our calculation, as it is altogether outside that now built on; and I think you will readily see that the great waste of space necessitated by the irregular plan of the district, as now actually existing, would allow to a very great extent, if not altogether, for the extra space which the suggested re-arrangement would require.

As to the general arrangements of the streets and houses, I will call your attention to some methods, unusual to us, with which one meets abroad. I omit any notice of the large many-storied houses which are familiar to you on the Continent, and I shall take, as examples, one of the northern towns in Europe, Hamburg, and one of the southern ones, Naples. Several years since, I was commissioned to make a detailed report on the former town, for one of the principal Insurance Offices (the Union) of London, and I was thus led to see more of it than, perhaps, most of the people who visit it. The arrangement is peculiar. The main streets are wide, and give to a casual passer-by scarcely any indication of their affording access to any other streets. But a nearer inspection shows numerous doorways, so low and narrow that they appear to lead only into cellars, and through which you have often to descend by steps, and these lead into the streets behind, locally named Hofs, which we should call alleys, and which are, of course, completely closed against ventilation from the main street. They vary from 20 ft. to as little as 5 ft. in width, the houses in the wider streets overhanging on each side and being densely populated. They usually abut on canals, and when these are dry the result in hot weather may be imagined. This arrangement, intended, no doubt, to bring different classes of people together, reminds one of the Wynds of Edinburgh, but with all their evils intensified, and a worse result could scarcely be imagined. Very many of these have been demolished, but a large number still remain.

I take you down now to the sunny south at Naples, where the same attempt has been made. It is not in my province now to describe the ordinary houses there, of the horrors of which Sig. Gallenga and Mrs. Oliphant have given most vivid descriptions, but only the particular class to which I have alluded, and which may be seen to perfection in the drive through Portici. The streets throughout are wide, and lined for the greater part of their length with frames of macaroni hung out to dry, and many here will no doubt well remember both the sight and the smell. The houses on each side are several stories high, the first floors (*piani nobili*) having wide balconies, and altogether having a cheerful look and being tenanted by well-to-do and often wealthy people, whose apartments are entered from an internal court approached from the street by a lofty carriage gateway, through which one has lovely glimpses of beautiful gardens sloping down to the Bay of Naples. But the lower stories throughout, close on the ground, are tenanted by humbler classes, their rooms entered from the street. Here, again, we meet with an attempt to combine the classes, and thus to prevent one neighbourhood being given up to the poor and another to the rich.

But again this fails. The lower rooms have no windows or other openings at the back, and derive the whole of their light and air from the street. The state of the inner rooms, usually parted off by a curtain as sleeping apartments, in the heat of an Italian summer may be imagined; and these rooms are not inadequately described by Mrs. Oliphant as "dark caverns with one vast door, giving all the light that can penetrate." Were it not that the people live almost entirely in the open air, they must be decimated. The same arrangement will be found in most other Italian towns, but in them there is, usually, some opening, however small, at the back.

Something of the same kind would appear to be adopted, judging from the plan only, in a flourishing town in our own country,—viz., Great Yarmouth, the arrangement of which is very peculiar, and unlike that of any other English town with which I am acquainted. I show a drawing of this, enlarged from one which was kindly drawn for me by Mr. Arthur Hewitt, an architect in the town, who has supplemented the Ordnance Map by many important details. The main streets are wide and well ventilated, and lined with good houses (mostly shops) several stories high; and running between these streets at intervals of about 45 ft. are long narrow alleys, termed Rows, out of which lead houses of an inferior class. Looking at the plan only, this would seem to be no better than Hamburg; but in reality they are vastly better. The entrances are open for their whole height to a wide street at each end, or to the spacious quay; the alleys are cleanly kept and well paved, the houses in them are low, so as to intercept the light and air very slightly, and each has a small court attached to it; and the whole arrangement, so far as I can ascertain, is not prejudicial to health. Nevertheless, the narrowness of the streets does, no doubt, to some extent, clash with the golden rule which Dr. Richardson put very strongly in his well-known lecture at Croydon (1879): "Make the sun your fellow-werkman," which is much the same as the Italian proverb, "Where the sun does not enter the doctor does."

Now, in remodelling our district, what system shall we adopt as to the houses? The first question is as to their number of stories. This subject is a serious one, for hundreds of acres near our towns are now being covered with two-storied dwellings, clustered close together in populous neighbourhoods, or semi-detached when more in the suburbs. As to this, I do not wish to lengthen my paper by going into any argument, but I must briefly allude to some of the leading facts. The governing idea in respect of the self-contained houses of two stories is, of course, that of privacy, or, in the better class of houses, the absence of stairs; but in many of our new London squares one large open space, garden, or yard (according to the class of house), is common to all; and the separate houses are being largely superseded by the dwellings in flats. At the first sight the two-storied houses would appear to have the recommendation of ensuring a less dense population than in the many-storied ones; but I wish to consider the subject on the basis of the same number of inhabitants in each case, the area gained by the extra stories being appropriated to open spaces in the way of yards or gardens, so that no question as to the bearing of the density of the population upon their health will arise here.

In considering the relative merits of the different styles of houses, the first fact which presents itself is, that with those of two stories only, the whole of their inhabitants must live and sleep either immediately over the ground or directly under the roofs.

I need scarcely say that the nearer to the earth the ground-floor is the cheaper it is to build, as less height of wall is required; and the consequence is that the floor is raised a few inches only above the street level, and the occupant has only that space between him and the earth. The rest of the inhabitants must live and sleep directly under the roof,—not a very pleasant experience even in well-built houses, whether through the heat of summer or cold of winter; and very many here, doubtless, know what is the case where the house is run up cheaply merely to sell. In point of economy of building, and of course of rent, it must be borne in mind that, though the thickness of the lower walls must be somewhat greater in a high house than a low one, one roof will cover, and one foundation hold up, four or more stories, as well as they will cover and hold up two.

As to the general feelings with respect to the subject, I recall and agree with the words of my predecessor, Professor Roger Smith, in his address at Glasgow in 1883,* that the system of flats is opposed to the general feeling; and I agree with him, also, when he says that they are not so unpopular now, and have many advantages.

Of course, the height of houses, whether in flats or separate, varies very much, buildings of five, six, or seven stories being common enough,—my own house has six; but I propose, in the comparative plans which I show, to limit our consideration to four stories, which is the limit suggested by Professor Robinson, in his address at Newcastle, 1882.† My plan shows, first, the actual space at present occupied by two blocks, each of fifty-eight two-storied houses, and their open areas of streets and yards; and, secondly, the space which would be occupied and the area gained, if the same number of inhabitants lodged in half the number of houses, but four stories in height. The contrast as to open space is rather striking, and with increased height the size of that space will of course increase.

One thing more. In his well-known address in 1879, Dr. Richardson spoke of his ideal cities as competing with each other in the beautiful as well as the useful, and I have spoken all the way through of doing what we have to do in the streets, the buildings, the fountains, in such a manner as to give a cheerful aspect to the scene, and afford some scope, however slight, to the feeling of beauty which is inherent in mankind, whether for colour or form, for a flower or a building, and not to offend the eye by the mean and the ugly.

Years back, in the prime of his life, Mr. Ruskin pointed out‡ most forcibly "that it is chiefly by private and not by public effort that a city is adorned, and that it did not matter how many beautiful public buildings it may possess if they are not supported by and in harmony with the private houses (and, I may add, of the factories) of the town," and if it be held that all we have to do is to provide houses which shall be fairly comfortable, whether for rich or poor, and that rows of such houses will answer all the purpose if built with windows large enough and numerous enough, and that nothing else in them need be studied, then I say that our town lacks one great feature which might conduce to the pleasure of its inhabitants, and in neglecting that we have neglected one means, however slight, towards that healthful mental state which helps the bodily so well.

Masonry and Construction. — Mr. Lawrence Harvey's valuable class instructions on the subject of Geometry as applied to Masonry and Construction will be resumed at the City and Guilds Institute, on Monday evenings, from October 17th. The instruction is divided into three courses. The first course comprises the lessons given last year, by which a general idea of the different methods of stone-cutting will be obtained. In the two following courses, the applications of geometry and drawing will be more kept in view, and the exercises of cutting made subordinate to that. The present course deals with only half the subjects which a complete course of scientific masonry should treat, and it is hoped that a higher series of lessons will be initiated next year.

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* Transactions of the Sanitary Institute, 1883.
† Transactions of the Sanitary Institute, 1882-3, p. 185.
‡ Lectures at Edinburgh, 1854.

THE BRADFORD WATER SUPPLY.

THE following is the preliminary report of the Bradford Waterworks Committee, submitted to the Town Council last week, as to the scheme for additional water supply. After stating the circumstances under which, after the drought of 1884, the Committee, considering it necessary to provide an extended area of water-supply, instructed their engineer (Mr. Binnie) to go thoroughly into the whole subject, the report says the first investigation, directed to the utilisation of our existing Parliamentary powers, proved that the works authorised by them would be as expensive as the works already executed, and that as they had been designed merely as additions, none of them would prove more than temporary expedients to overcome present difficulties, and that the advantages gained by their construction would be exhausted nearly as soon as the works could be completed. Pending the investigations which Mr. Binnie was making, a pamphlet was published by Mr. Paterson and sent to each member of the Council respecting a scheme in the Masham district. Mr. Joseph Smith and Mr. Rooke also kindly suggested a scheme on the Cragg Brook, a tributary of the Calder; and various other gentlemen contributed other suggestions of more or less value through the newspapers or otherwise. The whole of them received the most careful consideration. Without entering into unnecessary details, it may be stated, as the result of Mr. Binnie's investigations, that the Cragg Brook scheme presented very serious difficulties; and that the only practicable schemes which would meet the requirements of the Corporation were a supply from the Wharfe at Buckden, and a supply from the Masham district, so laid out as to deliver the water by gravitation and without pumping into the Heaton Reservoir, and so designed as to give a service reservoir at some point near the town. The Committee deemed the matter of such importance as to require personal investigation, and therefore the Buckden district was inspected by the whole Committee, and the Masham district was inspected by the Works Sub-Committee. It being the opinion of the Committee that the choice of site for the new works must rest between the Buckden and Masham schemes, they considered it proper that, on a subject of such importance to the town, and likely to involve heavy expenditure, it would be wise to obtain the opinion of Mr. Hawksley as to which of the two schemes was preferable. It was known that Mr. Hawksley had on former occasions to make himself familiar with the peculiarities and distinguishing features of each of these districts in reference to other schemes for the supply of other towns, extending back as far as 1854. His authority on the subject was invaluable; and, accordingly, in the early part of last year, the whole subject was laid before him, including the scheme suggested by Messrs. Smith & Rooke, and Mr. Paterson's pamphlet. The instructions to Mr. Hawksley were to give the Committee his unbiassed opinion after duly considering all the materials laid before him and making such inspections of the districts as he thought necessary; and, accordingly, having considered all the information laid before him, and having visited the sites, he attended the Committee on Tuesday, the 30th of August last, to state his views. He advised that the Cragg Brook scheme was impracticable, on account of the small supply that would be derived therefrom, and of the enormous opposition that would be met with; and as regards the Buckden and Masham schemes, that although a copious supply could be obtained from Buckden at a little less cost than from Masham, it was harder water than that from the latter district, and that the Masham water was much better adapted for the supply of the manufacturing industries of Bradford. He did not apprehend any formidable opposition to either scheme, and found that the Masham scheme would enable the Corporation to adhere to their system of giving compensation by separate gathering-ground and separate reservoir, whilst at Buckden the Corporation would have to undertake the supply of a guaranteed quantity daily to the mill-owners. In these views Mr. Binnie fully concurred. After enumerating the several grounds of agreement in opinion on the part of Mr. Hawksley and Mr. Binnie, the report adds that whilst Mr. Hawksley was before the Committee, a number of questions were put to him, and amongst them whether he had considered Mr. Paterson's pamphlet, and in reply he stated that he had done so, but considered the scheme suggested by Mr. Binnie to the Committee as the better. At the same time he added that it was not his business to come into conflict with any of the gentlemen who had kindly volunteered projected schemes, but it was simply his duty to tell them which, in his opinion, was the best course for the Corporation to adopt. As the Council will naturally wish to have some information supplied as to the cost of the alternative schemes of Buckden and Masham, the Committee have to state that the estimated expense of the Buckden scheme would be 1,133,200*l.*, and for the first instalment 831,250*l.*; in the case of the Masham scheme, the cost would probably be 1,292,000*l.*, the first instalment required would be 966,000*l.* In conclusion, the report states that the Committee have felt very great anxiety on this business. They are unanimously of opinion that the supply of water ought to be such as will meet the growing requirements of the town, not only as regards purity, but also as regards softness, and they are equally unanimous in their desire to avoid embarking unnecessarily in any costly enterprise, but they are convinced that an increased water-supply must be obtained so as to meet the growth of the population and trade of the district, which, before the construction of any large works, certainly requiring from eight to ten years for completion, will, in the ordinary course of things, outrun any present available supply.

MR. J. HAMBLET'S BRICKWORKS.

ON the occasion of the recent West Bromwich meeting of the Association of Municipal Engineers, a visit was paid to Mr. Joseph Hamblet's Piercy brickworks, at the Albion. The visitors were met by Mr. Hamblet and his nephew, who conducted them over the works, explaining without the slightest reserve the various processes in making bricks, tiles, and fancy articles. First came the blasting process in the marl-hole, where great quantities of marl and rock were blasted by dynamite and conveyed by tramway to iron wagons and thence to the grinding-mills. One of the most remarkable features of the marl is the fact that (according to the report in the *West Bromwich Weekly News*) it is suitable for either red goods or blue, and every article manufactured is from exactly the same clay, the only difference being in the length of time in burning, the hardest and most durable being caused by increasing and longer continued heat, the blue bricks being exactly the same as the red, only burned longer. The rock and marl, some of the pieces being of great size, is tipped into and passed through two pairs of rolls into the first mixing-pan and watered. Then it goes through another pair of rolls, after which it is conveyed by endless bands into a fourth pair, and passed into the second mixing-pan. This is then sufficiently prepared for the ordinary wire-cut blue or brindled bricks. For the best blue facing and paving bricks, the marl and rock in a plastic condition is passed through a fifth pair of large rolls, through another mixing-pan, and conveyed by an endless elevator band to the machine, and made into the best blue bricks for paving, &c. Upwards of 200-horse power is employed in the various processes of manufacturing. The bricks are taken from the machine in barrows by women and youths, and put on flues heated by fire, where they remain until sufficiently dry for pressing or otherwise. Mr. Hamblet's patent steam presses are excellent, being worked by friction discs, which are computed to give a pressing strain of 120 tons on each brick or paviour when in a semi-dry state, and any pattern can be pressed on the face of them. It is claimed that the bricks finished by this process withstand the highest crushing strain for bricks yet known, viz., 1,064 tons per square foot, as tested by Kirkaldy. Copings for walls are here made by means of wood moulds, some of the stock kinds being made by steam press. The kilns, —known as Scotch kilns,—are lined all over the insides with firebricks, but are soon destroyed by the heat required for the burning of blue bricks. About a fortnight is required to fill, burn, and empty, the bricks being subjected to the fire for about eight days and nights. They are afterwards loaded into boats and conveyed by rail to various parts of the country. One of the most interesting processes is the manufacture of encaustic tiles and terra cotta of every description. The fancy tiles have the patterns pressed on to them by a very simple but interesting process, some of them having to undergo as many as six different pressings. The ridge and chimney-pot machine is a very interesting one, and the articles are stated to be superior to the ordinary hand-made goods. Mr. Joseph Hamblet has recently added several branches of trade to his extensive works. Foremost of them is the architectural terra-cotta department; here there are being produced at the present time great blocks of richly foliated and delicately modelled red terra cotta of the finest surface, and as true as blocks of stone. Great technical skill is required in the manipulation of these blocks, and locally it is anticipated that South Staffordshire will soon be in the van of the clay trade in artistic productions as well as in the enduring material with which Mr. Hamblet's name has been associated.

Illustrations.

WINDOW, CHESTER CATHEDRAL.

THE large south transept window of Chester Cathedral, of which the stone-work was re-designed by Mr. A. W. Blomfield, has been filled with stained glass, the gift of Lord Egerton of Tatton. The subjects represented are the Crucifixion, Nativity, and Ascension, occupying the three centre lights, and sixteen subjects illustrating "Faith," taken from the eleventh chapter of Hebrews, are grouped around, filling up the lights on either side, the tracery being filled with a representation of the Angelic Choir. The window is designed in the spirit of "Old Glass," no attempt being made to copy the "Munich" or "Pictorial" school, Lord Egerton wishing to have a mosaic effect of colour, combined with figure drawing after the Italian Gothic school. The work was designed and executed by Messrs. Heaton, Butler, & Bayne, under the architect's supervision.

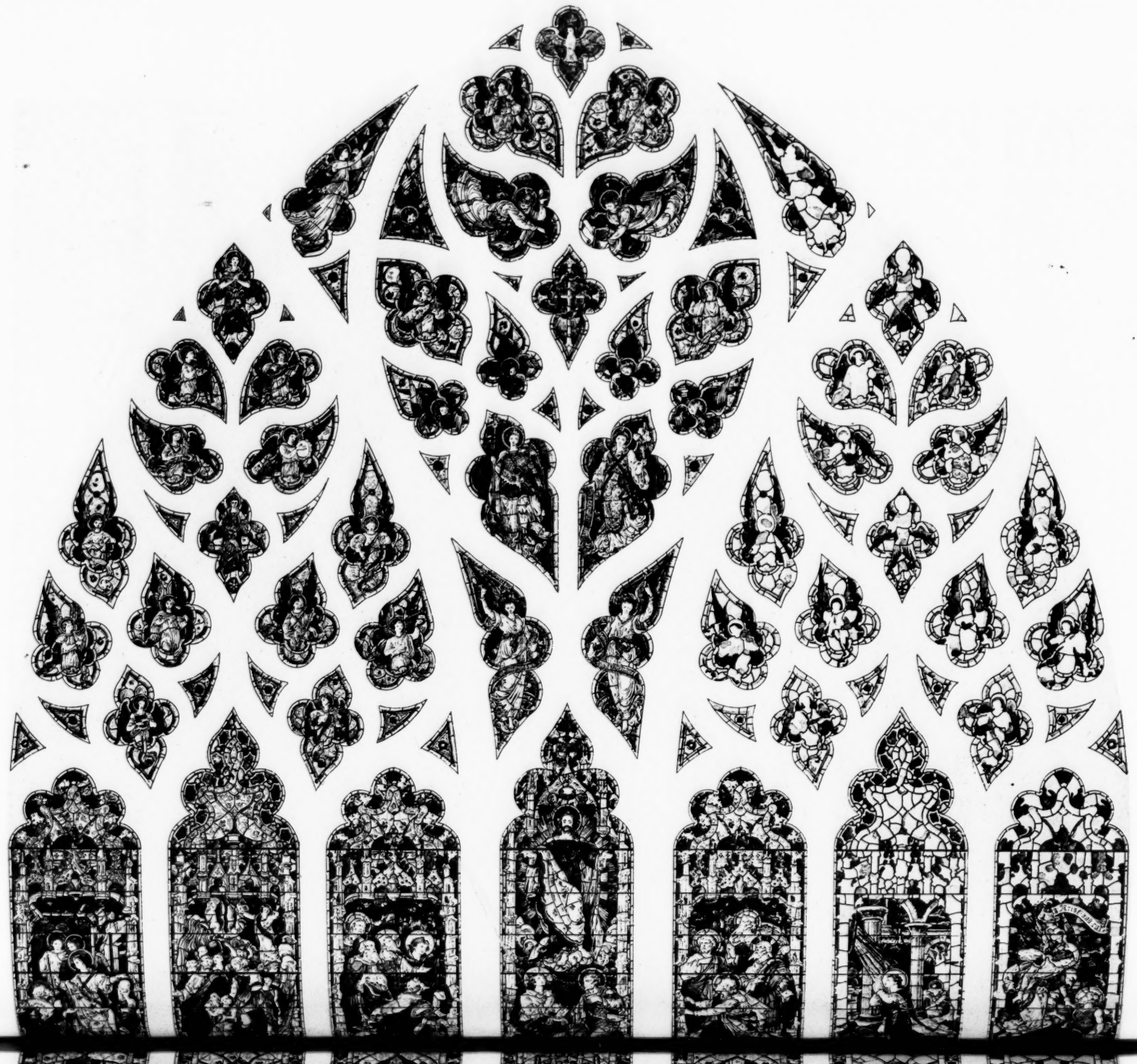
NEW FREE LIBRARY, NORWOOD.

THE building shown in our illustration is now being erected on Knight's Hill, Lower Norwood, for the Lambeth Libraries Commissioners, and is the first of several new libraries which are in contemplation. The site adjoins the new Post Office premises. The front is to be built of red bricks relieved with Ham Hill stone and terra-cotta, the arches and other parts being of gauged work. The pilasters over the main entrance will have busts of some men eminent in literature; all the other carving is to be emblematic of the use for which the building is erected. In the basement are lavatories, a large book-store, heating-chamber, &c., and over the front portion is a librarian's house. The fittings have all been specially designed by the architect, and the bookshelves are adjustable to any size book. Every book in the library will be shown on the indicator which is on the counter. The floors will be of wood blocks, and the ventilation, warming, and lighting have been carefully considered.

The builders are Messrs F. & H. F. Higgs, of Loughborough Junction, S.E.; the architect is Mr. Sidney R. J. Smith.

FOLKINGTON MANOR, SUSSEX.

THE view of this house, the residence of Mr. T. E. A. Gwynne, J.P., shows the additions that have been made and those that are proposed (shown in the plan by a grey tint). A visitor who knew the estate a few years ago would no doubt be sorely puzzled to recognise it now. The old public road passed within 20 yards of the drawing-room windows, the old cramped stables were close to the front door, and the mansion was so shut in as to be practically hidden. Now the site of the road is occupied by flower-beds and terraced gardens, the old stables have been pulled down, and the hunters and hacks are stabled in luxurious quarters shown in the view. When the dining-room and library are completed the mansion and its belongings will without doubt be one of the most perfect in Sussex. Mr. Gwynne is his own contractor, employing a regular staff of estate workmen, by whom the work has been carried out in very substantial and creditable manner. The architect is Mr. Peter Dollar.



WINDOW, SOUTH TRANSEPT, CHESTER CATHEDRAL.

Designed and executed by Messrs. HEATON, BUTLER & BAYNE, under the supervision of Mr. A. W. BLOMFIELD, M.A., Architect.

The Phototype Co., 393, Strand, London.

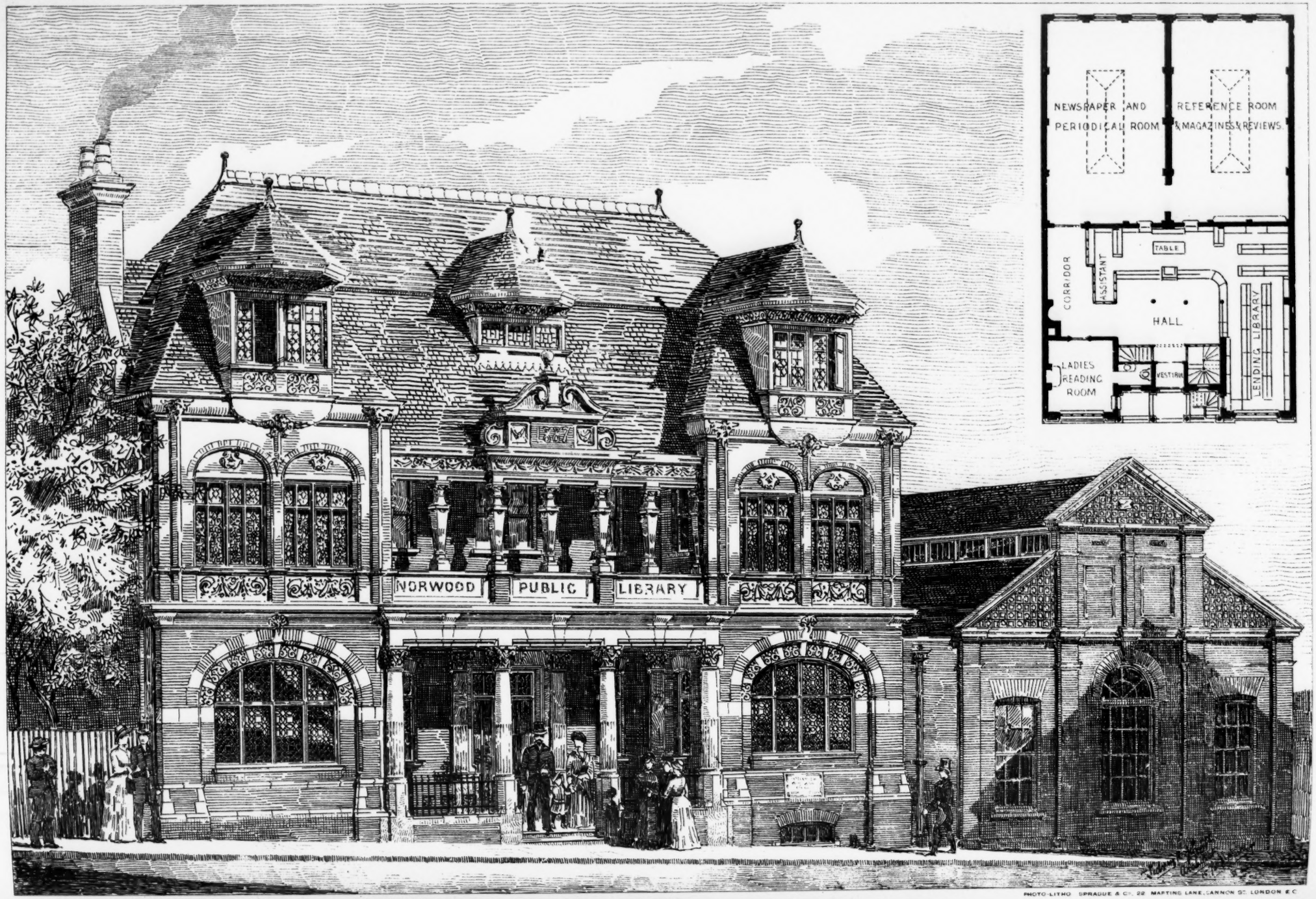
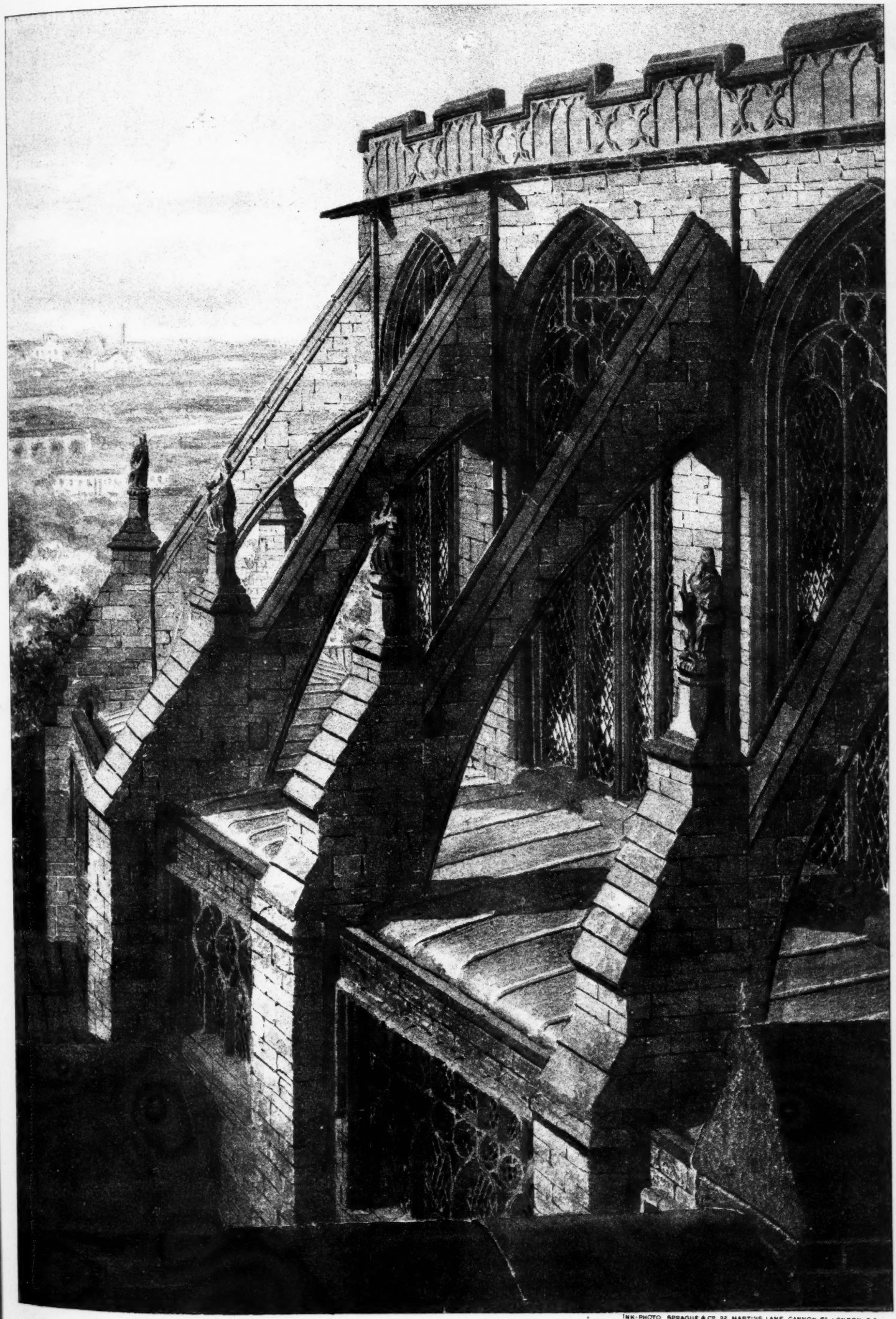


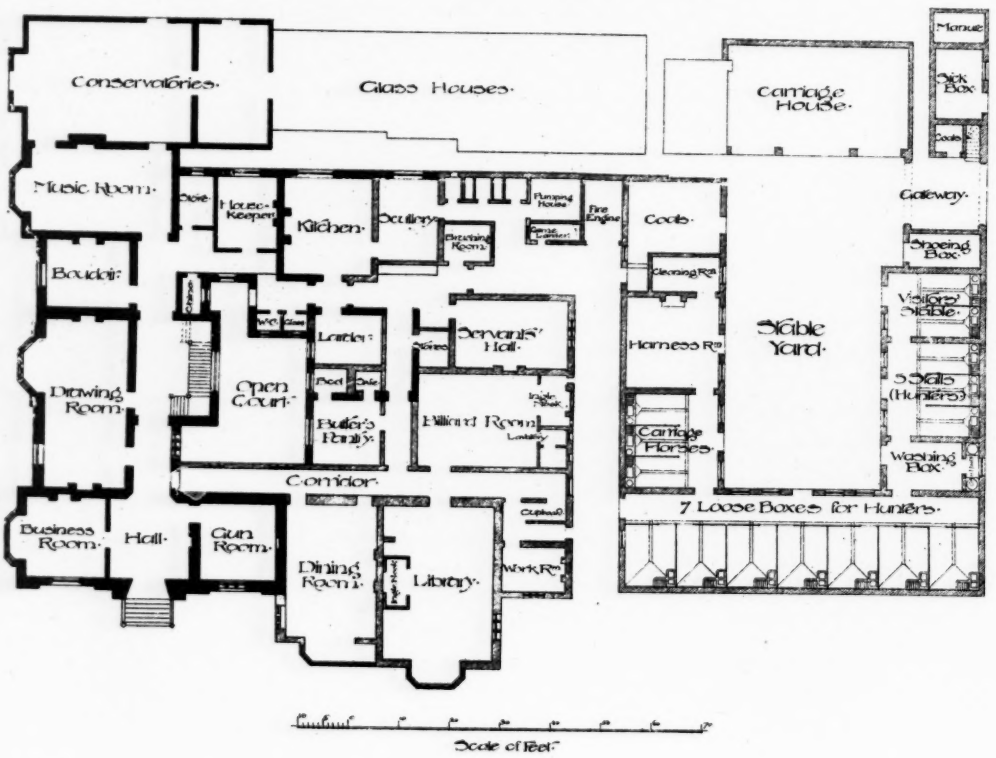
PHOTO-LITHO SPRAGUE & CO. 22 MARTINS LANE, CANNON ST. LONDON E.C.

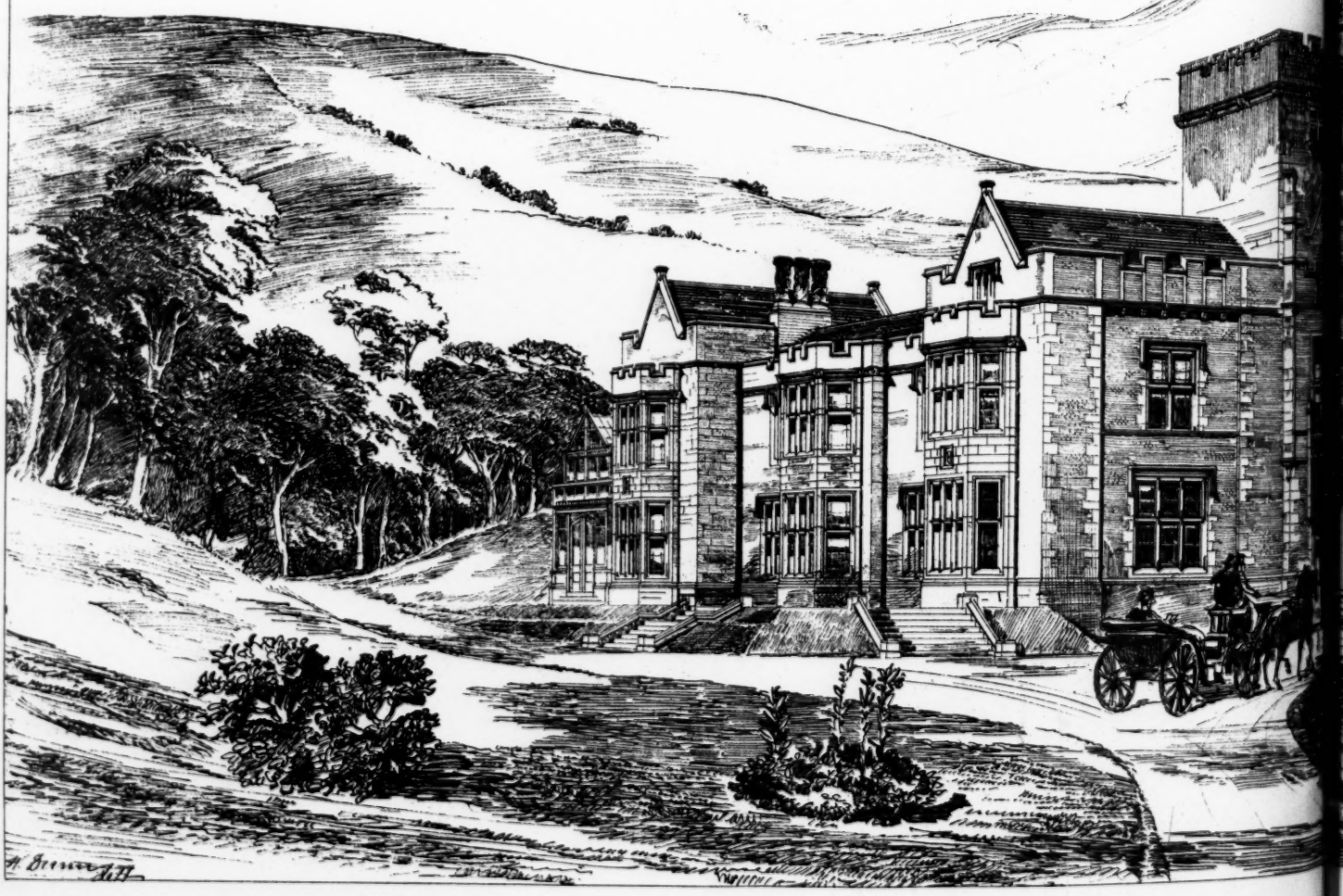
NEW LIBRARY, NORWOOD.—Mr. Sidney R. J. Smith, A.R.I.B.A., Architect.



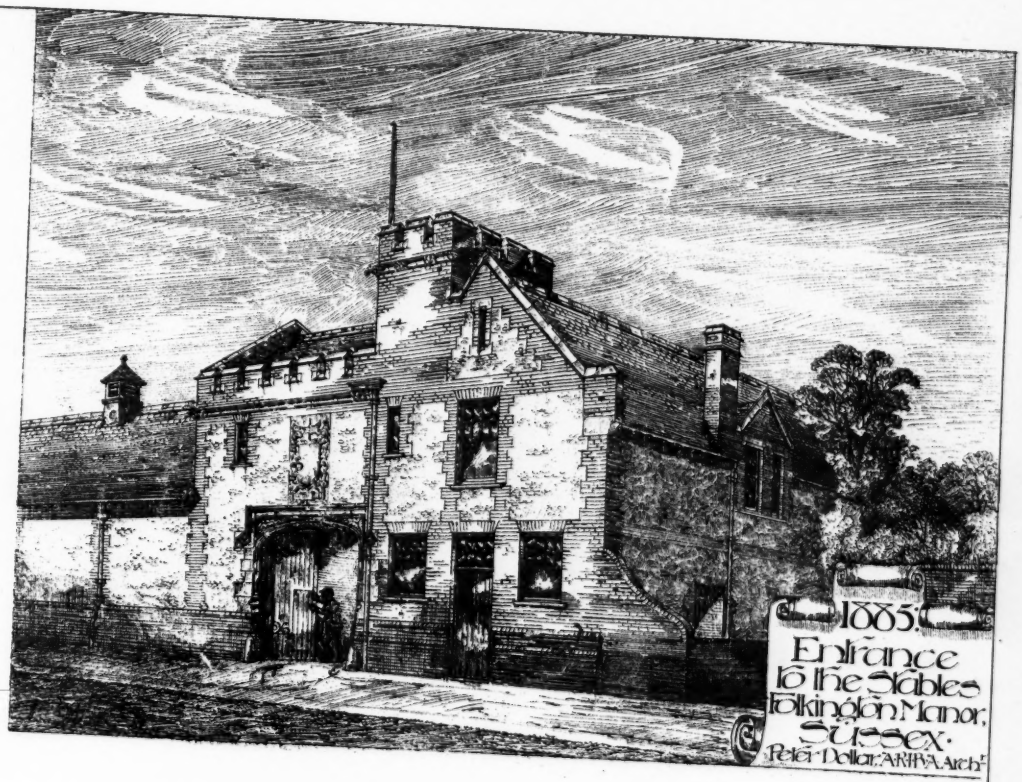
INK-PHOTO SPRAGUE & Co 22, MARTINS LANE, CANNON ST LONDON E.C.

ON THE LEADS AT NORWICH.—From a Sketch by Mr. H. H. Statham.





FOLKINGTON MANOR, SUSSEX.



1885.
Entrance to the Stables Tolkington Manor, Sussex.
Peter Dollar A.R.I.B.A. Archt

PETER DOLLAR, A.R.I.B.A., ARCHITECT.

PHOTO-LITHO. SPRAGUE & C° 22 MARTINS LANE, CANNON ST. LONDON, E.C.

SUGGESTED AMENDMENTS IN SANITARY LAWS.

THE Right Hon. Lord Basing, F.R.S. who (then Mr. Sclater-Booth) was President of the Local Government Board from 1874 to 1880, is President of the Congress now being held at Bolton under the auspices of the Sanitary Institute of Great Britain, and on Tuesday evening he delivered the opening address of the Congress, from which we extract the following:—

For my own part, I do not wish to appear before you as an optimist or a pessimist,—certainly not as an optimist. Passing by for the moment the question of the standard or ideal at which we should aim, I find plenty of material for legislation, change, and improvement stored up in various ways, and ready to be put forward when time can be afforded for anything except questions affecting the condition of Ireland. The more important of these (of which I shall presently give a catalogue) have been derived by what I have already described as the most legitimate and satisfactory of all methods, viz., from applications to Parliament on the part of private Bill promoters, mostly our larger and more populous cities and towns, during the last six or eight years. I have twice during that period acted as chairman of the Parliamentary Committees to which the more important of these Bills have been referred; referred, however, with the view of curtailing rather than encouraging exceptional legislation, and of moderating the tendency to extravagant expenditure by means of borrowed money. Many of the provisions mentioned in the list have been conceded, others are so far recognised as needful to be provided that they will undoubtedly be included in the next, nay I hope the approaching, amendment of the Public Health Act, 1875.

I well remember, amongst the most striking and comprehensive of the applications which have been made to Parliament of late years, an elaborate consolidation and amendment of the Bolton Improvement Act, which, together with some others of the like authority, has exercised no small weight in the process of selection to which I have alluded.

Although the Public Health Act, 1875, may be said to be complete as a general measure, so far as regards the accepted sanitary requirements at that time, subsequent experience has shown it is now capable of amendment in several important particulars.

The following are some of the amendments which have been suggested:—

1. The importance of separating sewage from surface water is now recognised.

The Act is, in its present form, practically prohibitive of schemes for that purpose; and power is therefore wanted to enable Local Authorities to provide a dual system of drainage. The Corporation of Reading were so sensible of the importance of this arrangement that they were mainly induced by a consideration of it to promote their local Act of 1881.

2. Provisions are needed to prevent injury to the structure of sewers and their obstruction, and the evolution from them of specially noxious vapours from chemical works, &c.

3. It has been frequently urged that communications between drains and sewers should be undertaken by the Local Authority, at the cost of the owner, instead of by the owner. The central authority should be empowered to decide upon the junction of the sewers of one Authority with those of another.

4. Local Authorities might have power to regulate, in addition to materials, size, &c., the ventilation and height of sleeping-rooms, the trapping and junction of drains, &c., in connexion with dwelling-houses. More powers are also needed with regard to enforcing the repairs of vaults, &c., under streets. Provision is also needed for the regular inspection of houses during their construction, to see that proper materials are used.

5. Provisions would seem desirable for probibiting the construction of rooms over privies; and power might be given to impose a penalty on persons who, after notice, neglect to repair or cleanse their water-closets, earth-closets, privies, or ash-pits.

6. Local Authorities, who undertake or contract for the removal of house refuse, cannot make by-laws relatively to such removal. They should have power to make by-laws ancillary to the work so undertaken by them or their contractors.

7. Larger powers should be given to Sanitary Authorities for the protection, both within and beyond their limits, from pollution of water courses from which they derive their water-supply; and lords of manors might be empowered to make grants of waste lands for purposes connected with water-supply.

8. Parliament has very generally accepted in local Acts proposals for the prohibition of the use as dwellings of premises constructed, and ostensibly intended, solely for use as "lock-up shops." There might now be a general enactment to this effect.

9. A Local Authority should have power to cancel the registration of a common lodging-house. They cannot do so now.

10. Back-to-back houses should be prohibited in future.

11. Power should be given to proceed against offenders when an article of food has been found unfit for use after it has been sold, or where it has not been exposed for sale, but delivered under contract.

12. Many local Acts empower the Local Authority to disinfect houses. This might now be made general.

13. A considerable number of Local Authorities have obtained Acts enabling them to require medical practitioners to notify any occurrence of dangerous infectious disease. Power should be given to the central authority to clothe Local Authorities with this power on application, so that they need not incur the expense of a local Act for the purpose.

14. Sanitary Authorities should be authorised to issue notices and advertisements warning the inhabitants against conduct likely to spread infectious disease.

15. It is desirable that some power should be given to remove to hospitals persons attacked with infectious disease, when isolation is not otherwise practicable.

16. Local Authorities should be enabled to provide temporary shelter for members of a family in which infectious disease has appeared, whilst the house is being disinfected and cleansed, and to provide nurses for attendance upon persons suffering from infectious disease.

17. A penalty should be imposed on persons ceasing to occupy houses where there has been infectious disease without previous disinfection or notice to owners, or making false answers.

18. Bodies of persons dying in hospital of infectious disease not to be removed except for burial, and corpses not to be carried in public conveyances other than hearses.

19. The Medical Officer of Health should be empowered to enter a house where he has reason to suspect the existence of infectious disease on obtaining a magistrate's order.

On the other hand, I certainly do not wish to appear before you as a pessimist, and I feel bound, as the final result of my experience, such as it has been, to say, that, having regard to the comparative novelty, and to the difficulty and obscurity of the subject, to the dislike of control, and to the great expense attending works of sewerage and water supply; still more, when we remember the disinclination of Parliament to turn aside from the more striking and generally interesting matters which make or mar the fortunes of Governments and parties,—I feel more than satisfied, on looking back over a period of thirty years, to find that so much has been really accomplished. At this moment, my apprehension undoubtedly is that, in the anxiety to escape from the irksomeness of detail, and in the hurry to establish local government, generally on a wider and more popular basis, mischief may unwittingly be done through misappreciation of the difficulties under which that which now exists has been built up, and of the great risk which may be run if such central control as is really still required were to be hastily surrendered.

But, further, that a pessimist view is really unjust and untenable, statistics abundantly prove. I have already given more than sufficient for my case, but I will take the liberty of borrowing, what I am sure our veteran champion, Mr. Chadwick, will readily lend, a few of the more striking illustrations which he gave to the world on a recent occasion when celebrating the Jubilee of Sanitary Science:—

"The present reduced annual death-rate for the metropolis may be stated at 19 in 1,000, but the sanitary engineer could undertake its reduction by 5 in 1,000, and at a cost greatly below the existing insurance charges for sickness, loss of work, and death. On what experiences, it may be asked, are the statements as to that conclusion based? The answer may be, that they are based on that which has been done for the common lodging-houses,—old buildings, once the seat of pestilences, but now cleared of them by very rudimentary sanitary measures; and on what has been done in blocks of buildings in the metropolis, and in old urban districts, such as Salisbury, where the death-rate, as high as 40 in 1,000, has been reduced to 16 in 1,000; in Dover, where 28 in 1,000, is now about 14; in Rugby, where 24 in 1,000, is now under 12; in Croydon, where 28, is now 10 to 15; in Matlock, where 18, is now 9."

Mr. Chadwick then proceeded to make some remarks leading up to the important subject of the economy of sanitation which he has recently worked into shape, and which I trust he may be able to lay before this conference, no branch of the subject being more likely to influence the popular imagination.

These and similar statistics have been put before the Sanitary Institute by Presidents and other speakers year after year, but they cannot be repeated too often. The period of activity is too soon followed by a relapse into apathy, and even when, through the agency of epidemics or other exciting causes, the time for constructive legislation comes round again, we shall find that the growing tendency to disparaging and fault-finding criticism on the part of public writers and speakers, coupled with the spirit of obstruction which now seems to be paramount in Parliament, will render the task of the Government increasingly difficult. They will accordingly require all the backing which public opinion can confer, enlightened as it must be by efforts such as this and other kindred associations are making, to carry them safely through the rocks and quicksands which will most assuredly beset their progress.

The address which I have thus ventured to lay before the Congress has been couched, for the most part, in abstract terms. But we must not forget that we are meeting in one of the most thriving industrial centres of the great county of Lancaster, and I trust that considerable attention will be given to the application of sanitary science to the needs of the populations which have grown up in these manufacturing districts. The cotton manufacturers have exercised no small influence in times past over the financial policy of the country. If the wealth and prosperity which followed, and in some degree flowed from, that policy, have caused an aggregation of human beings in and about the central towns to multiply with a rapidity and to an extent prejudical to healthy conditions, it is here that we should look for activity in remedial measures, and a ready recourse to all that can be done in the way of amelioration. Can it be said that the result is perfectly satisfactory? Is not the death-rate higher than it should be, and that even in Bolton, which is more healthy than many places that might be named hereabouts? Does it not, for instance, compare unfavourably with that of London? And, if so, do we find earnestness and discrimination on the part of the local authorities in pressing forward remedial measures, and acquiescence on the part of the people in submitting to the necessary expense? I have referred to the Bolton Improvement Act; but there are few towns of any size in the County Palatine which are not provided with similar facilities in the same way, and all are subject to the provisions of the Public Health Act, which, in the greater part of Lancashire, is doubly effective, as the sanitary districts are mostly of an urban character. In fixing their Congress at Leicester the year before last, the Sanitary Institute was not afraid to beard the lion of anti-vaccination in his den (to little purpose, I fear, if the statements of a letter in yesterday's *Times* are well founded). Let it not be said that we come only to prophesy smooth things at Bolton. We know the energy and capacity of the Lancastrian population. We must not shrink from holding up before them the highest ideal, and, I may add, the material advantages which are involved in determined efforts after sanitary improvements. Thus our visit to the North may become, as we should desire, a useful stimulus locally, as well as a signal manifesto of the principles we profess, and of the great national objects we have in view (applause).

Mr. H. Shepherd Cross, M.P., in moving a vote of thanks to Lord Basing for his address, expressed the indebtedness of the country to sanitarians, by whose labours and researches improvements in sanitary conditions had been brought about with the result, not only of diminishing the death-rate, but of preventing sickness. And it should, he thought, be more often borne in mind that the reduction of the death-rate did not half express the advantages which the nation gained from the labours of the sanitarians. Let them remember the amount

of sickness which was prevented by the observance of sanitary conditions, and the consequent gain to the community, as contrasted with the privation and penury which often followed through the illness of the wage-earner of the family, even when the illness did not terminate in death. He thought the Congress was much indebted to Lord Basing for his excellent address, in which he had clearly traced the course of recent sanitary legislation and its results,—results which the noble Lord himself had some share in bringing about (applause).

Professor J. Russell Reynolds, M.D., F.R.S., President of Section I. of the Congress (Sanitary Science and Preventive Medicine), in seconding the motion, said that he was glad to find that there was a growing opinion in favour of the compulsory registration of disease as well as death, and when that opinion ripened into action, and complete statistics of disease were collected, some more than doubtful assumptions, based upon or deduced from mortality statistics, would be corrected or verified, while the increased precautions which would inevitably follow from the publication of such statistics would, no doubt, tend to reduce death-rates still further. Speaking as a physician, he was able to testify that,—until within the last few years especially,—nothing could be more slovenly, not to say dishonest, than the way in which the existence of disease of an infectious sort had been concealed. As illustrating the importance of having statistics not only of deaths but of disease, he might call the attention of the Congress to the fact that while much was being said just now as to the prevalence of scarlet fever in London, the mortality had, happily, not been high; indeed, during the present epidemic the mortality from that disease had been below the average of previous years. The proposed compulsory registration of infectious disease, to which Lord Basing had referred in his address, was thus a matter of the greatest importance (hear, hear).

The motion for a vote of thanks, having been put to the meeting by Professor Corfield, was carried by acclamation.

Lord Basing, in acknowledgment, referred to the labours of Lord Norton (formerly Sir Charles Adderley) in connexion with sanitary legislation and administration.

REFUSE DESTRUCTORS AND THEIR RESULTS UP TO THE PRESENT TIME.

A FORTNIGHT ago (p. 360, *ante*), we gave the substance of a paper on this subject read by Mr. Charles Jones, Surveyor to the Local Board of Ealing, at the Leicester meeting of the Association of Municipal and Sanitary Engineers and Surveyors. In the discussion which followed the reading of the paper,

Mr. Lemon (Southampton) said,—I, together with my friend, Mr. Jones, visited Leeds, and went back rather impressed with the value of the destructor; and, with other members of the Town Council, succeeded in getting a destructor erected. At the first blush of the thing, a destructor looks like an expensive and wasteful article. In Southampton the refuse was sold for about 1s. 6d. per ton. The cost of the destruction, you have been told by Mr. Jones, is about 1s. per ton. Thus the actual loss is about 2s. 6d. per ton. This is rather a large item in the expenditure of a town, but on the other side you get the advantages from the burning of the refuse. This, I think, ought not to be lost sight of. In conversation with Messrs. Fryer the other day, I found that in towns where the power generated is utilised, the loss is remarkably small. I do not think, according to what he told me, that 20 per cent. of the towns in England where destructors are used turn the power generated by burning the refuse to any advantage. Now Mr. Cartwright, the Borough Surveyor of Bury, in the paper read by Mr. Santo Crimp, gives some results bearing on this point. He says that sixteen tons of refuse daily would enable an 8-horse-power indicated engine to be worked twenty-four hours by the steam generated. If you work this out, you will find it is ½-horse-power per ton. I think that is a very simple and useful fact to remember. In my own borough the amount of refuse burnt daily is about 50 tons, and we get about 30-horse-power, a somewhat higher result than that given by Mr. Cartwright. But you must bear in mind that the quality of refuse varies considerably during the year. I do not think Mr. Cartwright has over-estimated the power, and if you take his datum, which is a very simple one, you will have something on which you can found your calculations. If the refuse of Leicester, which has a population of about 140,000, were utilised, you would get a useful effective power of about seventy horses. This is a thing which ought not to be overlooked; and this is to be set off as against any increased expenditure in the use of a destructor. As time is short, I will turn to the burning of sludge. I do not agree with the conclusions of my friend Mr. Jones as to the burning of sludge. I do not think that is the solution of the difficulty. In my own borough, we had a very long litigation with cement manufacturers, and that was occasioned by the complaints of their works being a nuisance to the neighbourhood. Now, if the burning of the mud of cement is a nuisance, under careful management, I am quite certain that the burning of sludge containing about 90 per cent. of water must be a nuisance, unless it is very carefully managed indeed. I should hesitate, myself, to adopt the method of burning sludge referred to by Mr. Jones. I have seen his works; they are admirably arranged and excellently managed. But, as to burning sludge with the refuse, I must say I do not think it is the right thing to do. However, he gets rid of a nuisance, and that is saying something for him.

Mr. Hewson (Leeds).—I am glad of the opportunity of speaking, because I wish to do some service to the Association. I am not here to advocate any of the processes named by Mr. Jones; I am here simply to give the Association the benefit of my experience on this subject, to state what the Leeds Corporation have done. You have been told that the Corporation of Leeds were the first Corporation to build destructors. About the working of these destructors, the management of them, and my experience of them, I think I can give a few useful notes to those who have destructors but have not had much experience, and those who may have destructors. At Leeds, we had no sooner built the destructor than, of course, there were complaints of the disagreeable smell from the chimney. I ought to say that the destructor is built practically in the centre of the town, where there is a dense population; and you can readily conceive that if there were any cause of complaint, we should soon hear of it. There being cause for complaint, we did soon hear of it. The Corporation naturally endeavoured to remedy the evil by raising the chimney. But that did not remove the evil. There were still discharged out of the chimney quantities of disagreeable fumes and dust. For a certain distance around the works, according to the direction of the wind, there was a sort of "salting and peppering" constantly going on. From that time to the present this difficulty has existed, and to get rid of it has been the primary object of the different experiments we have made. To get rid of this dust, we first of all made recesses in the horizontal flue which passes between the two rows of furnaces. The flue, I ought to tell you, is something like 6 ft. wide, with sunk recesses on the right and left, forming store chambers for the dust passing along to deposit in. We found this did not answer because of the smallness of the provision. We found, indeed, that after two days these chambers were filled with dust, and the nuisance was as bad as ever. The result to-day is this:—We make these recesses in the bottom of the flue as large as we can, but every Sunday we clean out the bottom of the shaft,—that is, the bottom of the chimney. Notwithstanding that we make the horizontal flue the length of this room, the 6-ft. chamber at the bottom of the chimney-shaft, after a week's work, is pretty nearly stopped up. In fact, there is a struggle between the draught and the specific gravity of the dust, until there is only just enough space to allow the heated fumes to escape, no doubt bearing with them a great quantity of dust. Well, gentlemen, this dust difficulty remains with us until to-day. With a view of getting rid of it we visited Mr. Jones's crematory at Ealing a fortnight ago, and were very pleased with the result. We were told by Mr. Jones that he got a very high heat,—1,500°, whereas at Leeds we only got 700°. Therefore his crematory is very effective, because if you get a furnace at 1,500°, through which these fumes have to pass, you will necessarily get a great deal more perfect combustion. That I think will be patent to all of us. With regard to the nuisance of the smoke, there is another thing we have found it necessary to do, and that is to watch very carefully the charging. The men very much preferred to charge the ten or twelve cells right away, and then light their pipes and go and skulk for an hour or two. They preferred that system to the one we have now adopted in Leeds of charging only a pair of cells at a time. We used to charge the cells as quickly as the men cared to do it, every 2½ hours. The cells are back to back, and we now make them charge every twenty-four minutes. The result is that we do not have coming out of our chimney-stack for half the time large volumes of disagreeable fumes from the cells being charged regularly. Only a very small quantity is now visible. By this system, too, we get a more uniform heat. Under the old system, immediately after the general firing the temperature went down 150 degrees. Among the other things we tried to secure better combustion was that of making a great number of holes in the fire doors, so as to let in a quantity of oxygen over the fire, and to make this more effective we put in bafflers on the soffit of the arches. These we secured to the arched roof by pieces of sheet iron, which would have the effect, when the current passing through these holes struck against these bafflers, of throwing it down upon the fire. These were very useful, and the two things together did a great deal towards giving us a redder fire and less dead matter on the top of the burning fire. The committee wished to do something better, for still we had complaints; we then raised the chimney-stack 30 yards higher. Even to-day, however, the fumes which come from the top are very heavy, and when the wind is quiet the lee side of the country suffers from a very disagreeable smell, within a radius of perhaps a mile,—the peculiar dry smell of burning wet, dank, vegetable matter. We tried after this a system of blowing. I laid round the whole of a block of ten furnaces a line of 12-in. pipes, and out of each of these I took a junction of 10 in. into each ash-place, and I got the mouth of each ash-place bricked up round each junction. Well, of course, when I came to utilise this system I found I had not the necessary power. Although we consumed 50 tons of refuse per day, I found we had not more power than some sixteen or seventeen horse-power,—that is, break power outside the engine. I then wrote to the most noted men in the country who make blowers,—who make this a speciality and supply large blowers. I got from three firms estimates of the cost of machinery and blowers sufficient to do the work, with a guarantee that the machinery would be sufficient to produce the necessary blasts in each of the cells. But it came to this, that I really could not undertake it without 50 horse-power at command. A system of blowing into an enclosed ash-place practically requires 5 horse-power per cell. After the pipes had been laid, whilst thinking about this and talking over the question with the man who had done the work, he said, "What do you think about putting a steam jet under each fire-grate? Rip your machinery out, and take steam actually to the work to be done." I replied, "We will try it." Well, we have attached it to a pair of the cells, in the manner you see in the section before you. A steam pipe is turned into an open pipe which passes into the built-up ash place. We found that, acting in a sense after the manner of an injector, it induces a current of air to press under the fire-bars, which gives me most readily over 1,500 degrees of heat. The effect upon the fire, of course, is much more rapid consumption and much more flame, due to the admission of hydrogen in the shape of steam. This, in fact, is what we are doing now. When I speak of a jet of steam I speak of a quarter of an inch jet, and a pressure of anything between 25 lb. and 30 lb. The committee have ordered me to attach the system to the other furnaces; but, at a meeting which we had the other day, we were not quite sure whether it would not be better to adopt a system of furnaces like those attached to Mr. Jones's crematory. One of the members of the committee, not a scientific man, but a hard-headed Yorkshireman, put a very plain proposition. He said, "I know, of course, that heat is heat, but that will not do everything. I can understand that heat will make substances break up, and reorganise themselves as different gases, but I can understand that heat might not be a perfect cure. I cannot help thinking that if these fumes were passed through *clean* fire they would really come out less harmful

than if passed through high heat where the fire was *not* clean." Personally I am not chemist sufficient to deal with this aspect of the question. However, as some testimony to Mr. Jones's efforts in this matter, I thought I had better name it. Then as to cost: I may say we have made all sorts of attempts in the way of economy in dealing with our destructors. We have two destructors, so that the carting is not so great as if we only had one. But I cannot get the cost any lower than 10d.,—that is, including every charge for capital and depreciation. I think I have now told you all we have done; as to the future, whether the steam we have at present will be sufficient for the ten cells yet remains to be seen. I think it will, because we know we can now work 15 to 18-horse power continuously, in the way of making mortar. We certainly ought to be able with double the heat. If we raise the heat up to 1,500 degrees through the twenty-four hours, these units of heat are obliged to go somewhere; and if we utilise them by putting them into water, we shall have a better supply of steam in proportion.

Sir Robert Rawlinson. — This question of refuse destruction is so important that I have induced the Local Government Board to permit me to authorise one of the inspectors to undertake the collection of information on this point. I entrusted this to Mr. Codrington, one of the inspectors, whose report has not yet been completed. He has been visiting the various places, and I dare say he has come into contact with some of you gentlemen. He is getting together such information as he can obtain on this point.

The discussion of the subject was resumed at the recent West Bromwich meeting of the Midland District of the Association, when

Mr. Andrews, of Bournemouth, stated that after a good deal of inquiry they had erected there a destructor on the principle advocated by Mr. Jones, and started it last week. It cost them about 3,000*l.*,—600*l.* for three acres of land, 900*l.* for the ironwork, and 1,500*l.* for the brickwork and chimney-shaft; the latter costing about 500*l.*, and being 137 ft. high.

Mr. Dent, of Nelson, said that with the "Beehive" destructor they were destroying refuse at a cost of 1s. 3d. per ton, apart from the cost of the cremator.

The President (Mr. Gordon) remarked that taking the cost of destruction at 1s. per ton, they had to add to that the cost of carriage to the place. If they could reduce that cost it appeared to him they would do much to end the difficulty found in getting these destructors accepted, and the destruction of noxious emanations, so that destructors could be erected in the centre of populous localities, was involved in that. That was claimed to have been attained by Mr. Jones. But he was not sure they had arrived at the best method yet. Still, they owed a debt of gratitude to Mr. Jones for the pains he had taken in working up the subject, and the information he had laid before them.

COMPETITIONS.

Helston Public Rooms.—The Helston Public Rooms Company invited architects by public advertisement to submit plans and specifications for their new buildings, and offered a premium for the best design. Twenty architects competed, and the committee appointed to report upon the drawings advised the adoption of the design bearing the motto "St. Michael," the author of which is Mr. Charles E. Dyer, of Plymouth. The new buildings will occupy a central position, upon a site part of which is at present occupied by the Old Grammar School. This building is a well-built and substantial structure, and possesses more merit as an architectural composition than the majority of buildings of its period. It has, in addition, many interesting associations connected with it, and on these grounds, and upon the score of economy, it has been considered advisable to retain and embody with the new building the more important portions of it. In addition to the reading-room and library (to which the Old Grammar School is devoted) the buildings will comprise a business-room, a large committee-room for the use of friendly societies, smoking and billiard rooms, and a large hall, with suitable retiring-rooms.—*Western Morning News.*

Kingswinford Board Schools.—In the competition for the new schools at Mount Pleasant, Quarry Bank, Brierley Hill, for the Kingswinford School Board, the Board have accepted the design submitted by Messrs. G. B. Nichols & Son, of Birmingham, and have given them instructions to proceed with the contract drawings.

THE WALLS OF CHESTER.

SIR,—The question is not what the eminent antiquaries, whose names are published by Mr. Thompson Watkin [p. 411, *ante*] as supporting his theory of the age of the walls of Chester, thought in 1886; but what they think now, after the publication of the impartial verdict of Sir James Picton, Mr. Loftus Brock, and the meeting at Chester of the Archæological Association.

At the Congress of the Archæological Institute the evidence brought forward by Messrs. Shrubsole and Watkin was of an *ex parte* kind; and Mr. Shrubsole, from his long residence at Chester, was accepted, too hastily, as possessing a correct knowledge of the age and character of the walls. I know that some of the gentlemen then marshalled on the side of the Jacobean theory are now opposed to it; and we do not see one writing to support it.

The partial construction of Roman town walls with the monuments of an earlier time has been long well known as of frequent occurrence. I may instance Bordeaux, Dijon, Sens, Narbonne, in France; and Arlon, in Belgium, so well described by Mr. H. Schuermans, President of the Court of Appeal at Liège. The walls of London afford an example in this country, as the Guildhall Museum, through the exertions of Mr. J. E. Price, will testify. All these walls appear to have been partly built by the Romans with these sculptures. It was at first supposed that the portions containing sculptures were reparations, but additional evidence appears to show that they are of the age of the walls themselves.

All the sculptures found in the walls of Chester are Roman. That adduced by Mr. Watkin as a Mediæval *ecclesiastic* is a Romano-British girl holding a mirror, an example of which from the walls of Bordeaux I have given in my *Collectanea Antiqua*.

Mr. Watkin says I have said nothing of the *superstructure* of the walls of Richborough, Reculver, and Lymne. Surely it is not needed for me to repeat in such a discussion what I have published over and over again. They are faced with small squared stones, and bonded at intervals with tiles. The Chester walls have large squared stones, and no tiles. This was adduced by Messrs. Shrubsole and Watkin as evidence for their not being Roman. They did not consider the walls of *Isurium* (Aldborough), nor those of the *castra* to the north, nor the Great Wall itself.

C. ROACH SMITH.

Strood, Sept. 19, 1887.

SIR,—Mr. Thompson Watkin, in your issue of the 17th, refers to the jointing in the unmortared masonry of the walls of Chester and to some (alleged) change of opinion on the part of Sir James Picton when I "remarked upon the close joints of the stones." The words referred to convey the impression that Sir James's opinion was suddenly expressed, and after this piece of evidence only had been adduced.

Such was not the case. As I have elsewhere said, nothing could be more complete than were the facilities, not only for Sir James, but for all our members present, to see the work laid open for observation, and for all to form impartial and unbiassed opinions. It was only at the close of the long tour of inspection, and after the last of the evidences had been inspected, that he summed up the results of the visit, and his opinion was expressed. I heard it then for the first time.

I have no need now to notice many of the other points named in your correspondent's letter, since I shall have many other opportunities of doing so, but it may be of service at this stage of this interesting discussion if I refer to what he says of the section of the wall at the position named, west of the Phœnix Tower, one of the places laid open by the excavations. My doing so will render a better idea of the nature of the wall to your readers who may not have inspected the work, and be of service for future discussion. The wall of Chester here consists of a massive base of huge stones,—sandstone, set without mortar, having fairly close joints in front (outside the city), and resting on solid rock, which is, beyond the wall, scarped to a considerable depth to form the external ditch, the site of which is now the canal. The foundation consists of a projecting course, bedded level in the rock. There is then an irregularly-chamfered plinth, from which the wall rises to a height of about 10 ft. without mortar, and 8 ft. with mortar, the whole having a considerable batter inwards. There is then a neatly-worked chamfered course, and the wall terminates in an ordinary parapet, breast high, coped with a doubled splayed course. The whole of the interest in this discussion centres in the lower part, the unmortared masonry. This is of coursed work, laid fairly horizontally, but with a tendency to follow the inequalities of the ground. The stones are of great size and weight, some being as much as 5 ft. in length. The thickness at the base is about 8 ft. The upper mortared portion consists of smaller stones, generally in poor condition, while the reverse is the case in the lower part. On the inner side are clear traces of a sloping bank of earth, which appears at some time to have formed a means of manning the wall, such as we see, of Roman date, at Silchester; of Mediæval date on a Roman base, at Chichester; and of Mediæval date entirely, at Great Yarmouth and many other places. On this bank, on the inner face, a rough supporting wall, 7 ft. high, is built with mortar, having no foundation at all, and with hardly any sort of bond or support from the solid wall of masonry, but exhibiting the open joint described by Sir James. The inner face of the wall has been apparently removed before the formation of this wall, although its face originally may never have been so smooth as the outer one, consequent upon the backing of earth. Earth now fills many of the interstices of the unmortared stones, which I hold to be Roman, but whether formed so or the result of percolation, I am unable to say, although I think the latter.

This inner wall carries the present paved way within the parapet, which forms the well-known and greatly enjoyed promenade which goes all round the city.

It is in the unmortared part of the wall that the recent remarkable discovery of Roman inscribed, moulded, and sculptured stones has taken place,—a discovery which is still in progress, for hardly a single day seems to pass without some fresh result being obtained. Not a single stone has been found in the mortared part of the wall.

This distinction is not alluded to by your correspondent, but since it is so significant as to the date of the wall it is of importance to be stated. It was in this part that his "ecclesiastic" (so called) was found.

Such is, briefly, the wall which is referred to. While this is the description at the point named, it is in fact the same generally all round the city wherever it has been opened, the most apparent differences being that near the north gate the unmortared masonry rises much higher and ends in a moulded cornice; that at the Roodeye it goes down very deep, and the plinth has not yet been met with, and there is some mortar to the large stones; and elsewhere, as at the Kaleyards, the foundation consists of layers of small stones set in puddled clay where there is no rock. There are, however, many technical details to be referred to, and since their discussion will be so well understood by the tribunal of your readers, I will speak of them fully as soon as your correspondent will favour me with some more definite statement than he has yet done as to what he considers to be the age of the oldest portion of the wall. I need not trouble him relative to the small part called the Kaleyards wall, which stands by itself, the present wall of the city here making a small irregular bend, and thereby leaving it outside the line. This, I understand him to say, is Edwardian in date. His statement as to the other parts is not so clear. In a recent number of the *Chester Courant* he believed it to be the work of some Puritan builder. In his recent letter, p. 411, he states its date to be "in the reign of Anne." We are both referring to the large Roman stones on the face and at the base of the wall. Will he kindly tell me (1) which of these statements he considers most likely to be true? (2) Do not his remarks apply (as I undertand them to do) to the whole of the walls of Chester, the Kaleyards wall alone excepted? The period he may name will imply the building at that time of the whole of the wall, since these stones form the base and the portions above the base.

I will conclude these remarks promptly on being favoured with replies to these two inquiries, and I hope my reply will be sufficient to convince the majority of your readers and perhaps even your correspondent that wherever the unmortared stones occur there is Roman work *in situ*, especially since he already admits that the site of the walls is Roman, that the large walling stones are Roman, although removed from elsewhere, and that the cornice next the north gate is also Roman, but under similar conditions. As he must be aware, each of these three important items has been denied, and their assertion was among the principal things to which I had to address myself at Chester (*minus* the removal theory).

E. P. LOFTUS BROCK.

36, *Great Russell-street, W.C.*

SAFETY IN THEATRES.

SIR,—Amongst the many letters written lately respecting the safety of the public in theatres, the true cause of accidents has often been lost sight of. Suggestions are being made generally of safety from fire, whereas it is not a question of fire simply. Iron and water curtains to the proscenium are undoubtedly useful in case of fire on a stage, always provided they are kept in working order and used when required.

It is, however, not merely a question of fire, as witness the disastrous accident at Sunderland and elsewhere, where accidents and loss of life occurred from panic only.

Amongst the many proposals are the following:—

1. Outside balconies. This is really impracticable. In the first place, it would spoil any elevation, and again a rush from the inside on to the balcony means death as certain as down a staircase.

2. Going up steps to exit. This is a good idea, but unfortunately cannot be applied to a gallery.

3. Doors to open outwards by pressure from the inside is a good suggestion, as you remark in your last issue, but is no new idea; such doors are at present in use and have been so for some years.

4. Wide staircases are a great mistake, people cling to the handrails on either side, and in the rush persons in the centre are almost sure to be pushed down by those behind.

5. And lastly, it cannot be too strongly impressed upon the minds of theatrical managers,—a second exit in case of a panic is almost an absurdity, as any playgoer will admit upon giving the matter careful consideration. Suppose the public to be admitted to the gallery up a certain staircase; in case of panic, where will they rush? Not to a different staircase to which they entered, be exit printed over it in letters ever so large. They *will* endeavour to go down the same staircase they entered by: they are certain that leads into the street. Other exits may not do so, or doors may be locked and bolted at the bottom. The public have no faith in second exits. Again, if the public were admitted by two separate staircases, confusion would still arise: the playgoer again makes towards the door he entered. There would doubtless be less crushing, and more persons would escape.

The only way I can see out of the difficulty is to make a very broad staircase, as already suggested, but with this addition,—a newel wall, say about 4 ft. 6 in. high (so that a person could look over it), should run down the centre of it, forming, as it were, two separate staircases, side by side, each say 5 ft. wide. The audience on entering can then see that the *two* staircsses are real exits, the doors being side by side both at entrance and exit. No pass doors, as they are called, should be allowed to enter this staircase from other parts of the building. The staircase should be built of concrete, and enclosed by brick walls from top to bottom, with a concrete flat or roof over (no daylight is required in theatre staircases), thus making it absolutely fireproof, provided it be lighted either with oil lamps or electricity, so that in case the gas fails, the public can see their way out. PLAYGOER.

*** In regard to suggestion 3, we may observe that the form of door referred to in our note (p. 387) is entirely new in the principle and manner of working it. In regard to 4, the *Builder* has repeatedly and strongly pointed out the danger of too wide staircases without a centre baluster. As to No. 1, we entirely concur with our correspondent.

"SHONE'S EJECTORS IN THE RECENT RAIN-STORMS."

SIR,—In your issue of September 17th [p. 411] there appears a letter, signed "John Phillips, C.E.," in which an attempt is made to controvert statements about the incapacity of the Shone installation to deal with the rainfall, made at a meeting of the Society of Engineers by engineers to whom the epithet of uncivil is applied. As I was one,—I believe the only one,—who made the statements referred to, I feel sure you will allow me space to reply to the letter signed by Mr. Phillips.

My views were backed up by uncontrovertible arguments, stated plainly and straightforwardly, but without the slightest taint of rudeness or discourtesy. If Mr. Shone and his friends cannot bear honest criticism without indulging in personalities, they should neither read papers nor write letters challenging public discussion.

The statement made by myself was simply this, that the cellars of the Houses of Parliament would be worse flooded than they have been before if 1 in. of rain fell in one hour, when the maximum height to which the sewage has to be raised from the ejectors is equal to 20 ft. Mr. Shone may well say "Save me from my friends!" The contents of the letter prove, beyond question, that the cellars under the assigned condition would be flooded. Accepting Mr. Phillips's statement that the four gas-engines and three ejectors could deal with a rainfall of $\frac{3}{5}$ in. in an hour, with the exception of 2,000 gallons, it follows that the remaining two-fifths must be stored up somewhere within the precincts of the palace, *i.e.*, in the sewers and cellars. If 2,227 gallons per minute is the result of rainfall at the rate of $\frac{3}{5}$ in. per hour, an increase of two-fifths would add 1,484 gallons to the rate of flow per minute, or a total during the hour of 89,040 gallons, so that storage would have to be provided for 91,000 gallons below the surface level of the sewage in the metropolitan sewers because, previously to the Shone Installation, there was a slight flooding of the cellars, when the height of the surface of the sewage in those sewers corresponded with the 20 ft. lift of the Shone Installation.

The description of a rainfall of 0·59 in. per hour as tropical simply exposes the ignorance of the writer of the letter. A fall of 1 in. per hour is not by any means uncommon, and rain has been known to fall in the neighbourhood of London at the rate of more than 3 in. per hour for a period of fully half an hour. If, therefore, any of the archives of the Houses of Parliament are stored in the basement, it is plainly the duty of the officials in charge to remove them to safer quarters.

The whole contents of the letter are, however, from beginning to end a tissue of mistakes. Unless the official reports are wrong, although the whole area occupied by the Palace is ten acres, the rainfall from eight acres only enters the sewers. Certainly Mr. Phillips cannot object to my taking the lesser area as the basis for discussing the question. A rainfall of 1 in. per hour on eight acres is equivalent to 3,025 gallons per minute; so that if the three ejectors could discharge against a 20 ft. maximum head 2,200 gallons a minute, as Mr. Phillips affirms they did, reservoir capacity for 48,000 gallons only would suffice to prevent the flooding of the cellars. In the installation there are two ejectors of 300 gallons capacity, and one of 500 gallons. So that Mr. Phillips's statement that the three ejectors contain 1,100 gallons is correct. The discharging capacity of the ejectors does not, however, depend upon the capacity of the ejectors, but on the size of the inlet and discharge pipes, and the power expended in producing velocity. Now the size of these pipes is the same in all the ejectors. Why, then, did Mr. Shone specify the 500-gallon ejector, seeing that it can discharge no more per minute than either of the 300-gallon ejectors?

At my request the foreman in charge of the works measured these pipes, and told me that the outside diameter was only 6 in. This I found to agree with the diagrams in the pamphlet presented by Mr. Shone to the members of Parliament. The inside diameter cannot, therefore, exceed 5 in. In order, therefore, that the three ejectors should discharge 2,227 gallons a minute, each must discharge 742 gallons a minute, which means really discharging 371 gallons in fifteen seconds, if the times of filling and discharging are equal. The velocity of discharge in the 5-in. pipe must, therefore, have been nearly 30 ft. per second. Leaving out of consideration *the resistance due to friction and valve motion*, the head necessary to produce this velocity would be 14 ft., which, added to 20 ft., the dead lift, makes up a total of 34 ft. The corresponding air pressure is 15 lb. to the square inch. Taking into account the neglected resistances, the result claimed by Mr. Phillips could not have been produced with less than 18 lb. air pressure. Of course an equal pressure would be required to produce the same inlet velocity, or the surface of the sewage in the pump must have been at least 14 ft. above the top of the ejectors. How does Mr. Phillips reconcile this with the statement that only 2,000 gallons were stored at the end of the hour in the subway above the 12-in. pipe?

I shall be obliged if Mr. Phillips will state how the height of the sewage in the metropolitan sewers was ascertained. There are no means of doing this within the precincts of Speaker's Green, except the pump connected with the ejector, and if the statement that 2,000 gallons only were stored in the laboratory is correct, the surface of the sewage in the pump can never have been more than 6 in. above the 12-in. pipe.

I have carefully kept within the limits of the question raised by Mr. Phillips's letter, but, if challenged, I am quite prepared to maintain the correctness of all the statements I made at the meeting. I enclose my card, and beg to subscribe myself as one of the

MISCALLED UNCIVIL ENGINEERS.

September 20th.

RE LITTLE QUEEN-STREET.

SIR,—I observe in the *Builder* of the 10th inst. a "Note" drawing attention to the desirability of effecting a public improvement by rounding off the angle of Little Queen-street and Great Queen-street, and I therefore write to inform you that the Board of Works for the St. Giles District, in which district the property is situated, has for several months been negotiating with the owners for the acquisition of the property for that purpose, and I am pleased to add that such negotiations are likely to be satisfactorily completed and the improvement carried out.

G. WALLACE, Surveyor to the Board.

197, *High Holborn, W.C.*

A CURIOUS POSITION.

SIR,—Will you allow me to ask any of your readers if they ever were in a scrape like the following; and if so, how they got out of it?

A year or two ago a gentleman was about to build four houses,—two pairs,—to cost about 2,000*l.* each pair. He asked me to prepare the drawings, specification, and agreement for them. I did so, and, luckily, arranged with a most respectable builder to build them, who began one pair. When these were ready for the roofs, my client wrote me a letter, saying he would be his own architect for the second pair, and accordingly ordered the builder to begin them, using my plans and specification and copying the pair first begun. My position was really ridiculous, but I was powerless; as soon as I got up a floor, he got the builder to build the same in all respects with the second pair, and so he continued to do, till both pairs were finished, and the owner refuses to pay me a farthing for the second pair. If none of your readers have been in a similar difficulty, may I ask you to give your opinion on the point? A. B. C.

*** The question is essentially a legal one, and the legal right of the client to act as he did depends, we should imagine, a good deal on the precise wording in which the commission was given. If our correspondent means to press the matter, he had better consult a lawyer and give him full particulars.

REFUSE CREMATORS.

SIR,—In your issue of the 10th inst. [p. 360], I notice a report of the paper read by Mr. C. Jones, of Ealing, before the Association of Municipal and Sanitary Engineers. He has rightly found that certain local authorities have discarded the cheaper forms of destructors, which he names, but he omits to state that the cost of working his "Fume Cremator," as at present constructed, is so excessive that in one place at least it has already fallen into disuse.* I would point out the "fume furnace" on his patent No. 8,690, dated July 18th, 1885, is not novel, as my patent, No. 7,703, dated June 25th, 1885, covers the entire substance of his so-called invention. As a matter of fact, a furnace corresponding almost line for line with his Patent drawing was built and worked several months prior to July, 1885, at South-street, Bradford, and it is now working in connexion with four of my refuse cremators, Mr. Wilde, the manager of the Bradford Corporation destructors, being the real inventor of that furnace. Should evidence of this be required, it will be forthcoming, as also the fact that the use of separate coke fires has been found to be very costly where steam is not required. Mr. Jones is entirely wrong in his remarks about alterations of and experiments made with my cremators at South-street, Bradford, as the accompanying extract from a letter from the Borough Surveyor clearly proves:—

"Borough Surveyor's Office,
Town-hall, Bradford,
February 25th, 1887.

Dear Sir,— . . . . Your South-street Destructor has for over three years done the same amount of work with the same degree of efficiency as Fryer's Destructor at Hammerton-street, in proportion to the number of cells. Complaints were, however, made by residents in the neighbourhood of each destructor, about a nuisance or smell arising from the vapours and fumes discharged from the respective chimney-shafts; in order to remedy which your services were called into requisition, and you tried several experiments and made several alterations at your South-street Destructor, but with little or no success.

The experiments were tried at South-street in preference to Hammerton-street, not because the nuisance was greater from your destructor than from Fryer's, but merely because it was more convenient, both on account of its position and on the score of economy.

The South-street Destructor is not in use at present, simply because the Corporation have a very convenient and suitable tip for the dryer portion of the midden refuse made in that locality. This tip will probably remain open for nearly another twelve months, after which it is intended to resume operations at South-street. . . . Yours truly,

(Signed) J. H. Cox.

B. D. Healey, Esq."

The report of Dr. William Odling is freely quoted by Mr. Jones, but he does not appear to be aware of the fact that, when Dr. Odling asked to be put in communication with one of those by whom

* It seems a little odd that at Burnley the "Beehive" works as satisfactorily as the "Fume Cremator" does at Ealing, proving the local interest in each.

Bradford furnaces were constructed, I was the person called in to confer with him and the Borough Surveyor. It is desirable to have more positive information from disinterested authorities as to cost of fuel for the "Fumes Cremator." As to generating steam by the otherwise waste heat, most engineers know what can be done in that direction, but many authorities do not require steam from every cremator they build, and consequently the cost of fuel in such cases is very great.

My Economic Duplex Cremator, patent No. 9,342, A.D. 1886, which is constructed to burn its own fumes, is provided with large reversing valves similar to those used in a Siemens gas furnace. The fumes from the green refuse in one grate are passed over the grate of the adjoining furnace. This arrangement carries out in the fullest degree the conclusions arrived at by Dr. Odling in his report of September 9th, 1885, to the Bradford Corporation. The furnaces are charged alternately, so that one grate of a pair is always at a good heat when the other grate is giving off its smoke and vapour. I enclose full description of this furnace for your future reference.

B. D. HEALEY, Assoc.M.Inst.C.E.

Liverpool, September 15th, 1887.

PROVINCIAL NEWS.

Ashburton.—The foundation-stone of a new Cottage Hospital was laid at Ashburton, on the 19th inst., the site being situated on the eastern outskirts of the town, near the Newton-road. The building will have a south frontage of 100 ft., with a depth of 50 ft. in the centre, but the side wings will not have so great a depth, being only one story high. There will be four wards, all of which will be on the ground-floor, and on each side of the entrance the matron's apartments will be situated. Next to these rooms will be other small wards for special cases. At one end of the ground-floor will be the male ward, and at the other extremity will be the female ward. There will be two large and two small wards, the larger being 13 ft. 6 in. high, and will each contain four beds. The small wards will be 10 ft. high. On the ground-floor will be the operating-room, which will be at the back; and near to it a bath-room will be provided. At the back of all will be a kitchen and laundry. The second floor will be used as the committee-room and servants' apartments. The building will be fitted with all conveniences, and the ventilation and sanitary matters will have special attention. Mr. P. E. Masey, of Old Bond-street, London, is the architect; the contract for the erection being taken by Messrs. Hurrell & Roberts, of Plymouth, for the sum of 1,240*l.*

Kingston-on-Thames.—An extensive range of new buildings, forming a depôt and warehouses, has just been erected at Kingston for Messrs. Pickford & Co., the well-known carriers, as a centre for their increasing business in the district. The building has a frontage of 80 ft. and a depth of 87 ft., thus covering a ground-area of about 7,300 ft. It is between 40 ft. and 50 ft. in height, and contains four floors. It is faced with red Chelmsford brick, relieved by moulded brick string courses and dressings in Portland and Corsehill stone. The ground-floor arches of the gates and windows are all in blue Staffordshire and red gauged brick, the window lights being all of wrought iron. In putting in the foundations it was found necessary to go down to a depth of about 15 ft., which is about the level of the bed of the Thames. On the ground-floor there are two large goods sheds, both sheds being covered in with massive iron girders and joists, upon which is laid a concrete floor, forming a fireproof screen between the goods sheds and the depositories overhead. On this floor there is a large extent of stabling. The whole of the floor is paved with Norwegian granite cubes laid on a bed of concrete. The first, second, and third floors contain large warehouses, shut in by iron doors, and approached by fireproof staircases. The west side of the block contains the agent's residence, and also the offices for carrying on the business of the centre. The building has cost upwards of 8,000*l.* Messrs. Bressey & Liddon Walters, of Bishopsgate-street Within, are the architects, and the contractors are Messrs. Harris & Wardrop, of Limehouse. Mr. Thrush has acted as clerk of the works.

Ryde.—The Ryde Art Society will open its eighth annual exhibition on the 28th inst., under the presidency of Sir William Levinge, Bart. The judge of the competition works will be Mr. Drinkwater Butt.

Southampton.—The second annual exhibition of the Southampton Art Society will take place early in October at the Philharmonic. The private view and a *conversazione*, with an address by Mr. G. D. Leslie, R.A., will be on the 11th, when a good show of the works of local and other artists is expected. Among the exhibitors will be Major-General Lacy, the President; Messrs. Thomas Skeats and H. Masters, of the Ordnance Department; Mr. Drinkwater Butt, Mrs. Keary, &c.

Westbury (*Wilts*).—Extensive additions are now being made to the Angel Factory, Westbury, Wilts, for Mr. W. H. Laverton, which comprise thirty new looms, engine and boiler houses, &c. Messrs. Taylor & Challen, of Birmingham, are the engineers. Messrs. Halliday & Anderson, of Cardiff, are the architects.

CHURCH-BUILDING NEWS.

Abergwynfi (*Glamorgan*).—A mission church is about to be erected here, from the designs of Messrs. Halliday & Anderson, architects, Cardiff and Llandaff.

Bickington. — The new reredos recently erected in the newly-restored parish church of St. Mary's, Bickington, three miles or so distant from Ashburton, has just been wholly completed by the introduction of some sculpture by Mr. Harry Hems, consisting of figures of angels upon pedestals at either side of the base of the central gable, and of three large panels carved in high relief. The scene of the Nativity is in the centre, whilst angels swinging thuribles occupy the flanking panels at either side. The parishioners are indebted to the Rev. William Smith, their vicar, for the gift of the work.

Kilburn.—The Church of St. Paul, Kilburn-square, has just been reopened, after extensive alterations and repairs. The old high pews have given place to modern seats of polished pitch pine, a new aisle has been made in the centre of the nave, a new choir vestry has been made under the south gallery, and the chancel window has been considerably enlarged. The chancel platform has been enlarged, and the altar-rails set forward, and the building has been fitted with Keith's patent heating apparatus. The whole of the interior has been repainted and decorated. The old flooring has been taken up, the accumulated rubbish of fifty years has been carted away, lime concrete has been spread over the whole surface of the ground, and, after making provision for the free circulation of fresh air beneath, new flooring has been laid. New slating has been put on the roof, and new lead gutters, the old bad compo. has been cut away and replaced by new, the clock face has been renovated, and the whole exterior face of the building has been repainted. The work has been executed from the plans and under the direction of Mr. Alexander N. Hansell, by Mr. R. A. Yerbury, of Kilburn, at a cost of about 930*l.*

North Witham (*Lincolnshire*).—For some months past the parish church has been under repair, and was completed and re-opened on the 15th instant. The nave and chancel are of Norman work, the tower and spire, windows, and roof being of late fourteenth-century work. The walls have been underpinned, and all stonework carefully repaired, new buttresses, organ-chamber, and vestry being added. The roofs have been reconstructed to old pitch in Dantzic oak, the old lead being recast in churchyard and relaid. The whole of the interior fittings are of oak. The inside walls have been repointed. Mr. Wade, builder, St. Neots, executed the works, under the direction of Mr. Withers, architect, London.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

11,637, Dry Glazing. M. Macleod.

According to this invention, an improved sash bar of zinc or other soft metal is used. This bar is so formed as to allow for the insertion of an iron rod or pipe, or is strengthened by bars of metal or other rigid material of T or H rail, or other forms. Upon this are sprung or slided caps of zinc retained in their places by rivets or by clasps of steel, &c., sprung over the outside of the cap when it is in place. Drip channels are provided for, and brackets or lugs for carrying the improved forms of sash bars are also described.

12,514, Window Sash Fastenings. T. E. Lane.

This fastener is mainly designed to prevent the opening of the windows from without, and for rendering them perfectly draught and snow proof, and obviating the rattling in windy weather. A lever latch or catch is so made that when it is pulled forward it wedges the sash fast, and slips into a recess fitted to receive it, and by a turn of the front screw the whole fastening is effected.

13,035, Gas Chandeliers and Fittings. G. J. Williams.

The object of this invention is to dispense with the water-slide by employing folding rods or hollow arms jointed like lazy tongs. The arms of the said lazy tongs are hollow, and the gas is led along and through these. Weights are fitted as in ordinary chandeliers.

13,416, Lead Pigments. J. B. Hannay.

It is claimed that by this invention a pure or nearly pure amorphous sulphate of lead is obtained by treating lead compounds, ores, slag, waste, &c., in an improved furnace and by the addition of iron pyrites. A very pure white is said to be obtained.

3,431, Improvements relating to Water-closets. James Duckett.

In these closets, waste water, such as surface, roof, or slop water, is utilised. The trap of the closet is formed with an opening or space, the bottom of which is on a level with the surface of the water, and so large that articles deposited in the trap and incapable of being flushed through the same may be readily removed. The trap and framework for carrying the tipper are constructed of one piece of earthenware, so as to prevent leakage in the joints and to obtain a better base.

6,381, Cement Blocks, &c. F. O. Ferguson.

Instead of the iron or lead pipes attached to buildings, blocks or bricks with hollow tubes or perforations are, according to this invention, used, each fitted so as to form a continuous pipe in any direction, and jointed in cement. This will obviate the necessity of painting, &c., and the tube is far less subject to changes in temperature.

9,908, Cowl or Chimney Cap. H. F. Henry.

According to this invention, a Y-shaped cap is fitted so that the products of combustion will be divided and deflected outward in their passage through the cap. Shields or plates and cones are fitted so as to obtain the greatest force of wind for exhausting the chimney shaft.

NEW APPLICATIONS FOR PATENTS.

Sept. 9.—12,195, R. & G. Ellis, "Dog" for Fastening together Timber. — 12,207, J. Cartland, Bolts for Doors, &c.—12,239, R. Johnson and T. Benton, Hand Saws.—12,247, A. Spamer, Shaping and Trimming Slate.

Sept. 10.—12,266, J. Bradshaw, Chimney Pot.—12,271, J. Davies, Brick Kilns.—12,279, E. Williams and J. Morgan, Domestic Fire-grates.—12,291, W. Fraser, Automatic Door Closer.—12,301, A. Van Raalte, Steam Pile Drivers or Hammers.—12,307, J. Peckover, Stone Saws and Sawing Machines.

Sept. 12.—12,328, A. Melville, Fireproof Curtains for Theatres and other Buildings.—12,341, E. Kirby, Window Fastenings.

Sept. 13.—12,362, P. Barrett, Counterbalancing Window Sash.—12,377, T. Sharp, Preventing the Spreading of Fire in Theatres, &c.—12,383, B. Cocker, Protection for Gas-piping in case of Fire.—12,420, G. Paxton, jun., Corrugated Sheet Metal Roofs, &c.—12,434, F. Alford, Ventilator.

Sept. 14.—12,466, R. Hunter, Locks for Doors and Gates.—12,467, A. Winrow and H. Tandy, Brickmaking Machines. — 12,488, J. McConnell, Ventilating, Warming, Cooling, &c.

Sept. 15.—12,534, W. Ducker, Portable Buildings. 12,538, G. Redfern, Tile-making Machines.—12,539, G. Redfern, Draught, Wind, Rain, and Fog Excluders for Doors and Windows.

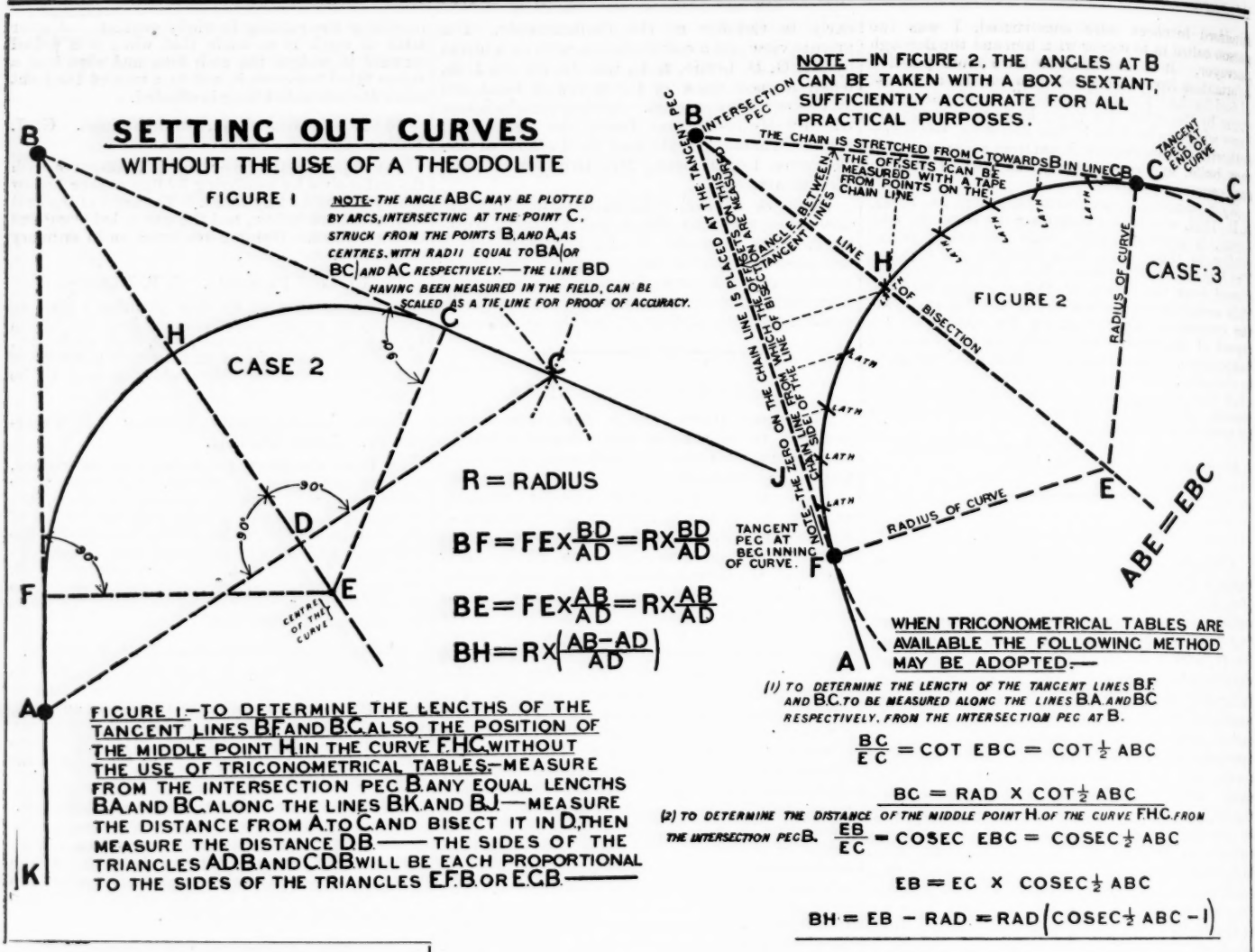
PROVISIONAL SPECIFICATIONS ACCEPTED.

10,548, W. Burt and C. Payn, Sliding Window Sashes, Panels, &c.—10,556, T. Buck, jun., Brick and Tile Making Machines.—11,007, C. Rùs Bonne, Staircase Lift.—11,045, A. Harris and Others, Window Fastenings. — 11,321, W. Harrington, Adjusting and Attaching Door Knobs to Spindles.—11,624, J. Stanna and T. Shillington, Stoves.—10,969, W. Akerman, Roofing Tiles.—11,265, H. Baugert, Flush Bolts.—11,566, R. Breumehl, Door Furniture.—11,863, D. Kempson, Drawback and Rim Locks.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

13,139, A. Berriman, Preventing the Escape of Gas when Taps are left accidentally open.—13,984, W. Lindsay, Moulding Bricks or Blocks.—14,206, R. Lee, Fastenings for Windows.—14,674, W. Scott and Others, Portland Cements, &c.—15,012, H. Macevoy and Others, Portland Cement.—3,390, J. McKee, Register Grates or Stoves for House Fireplaces.—11,889, F. Lyte, Manufacture of Pigments.—14,848, G. Barker, Ventilating Buildings.—15,144, W. Phillips, Water Taps.—9,783, A. Bayer and C. Mott, Cramp for Flooring and Other Woodwork.


SETTING OUT CURVES
WITHOUT THE USE OF A THEODOLITE
FIGURE 1
NOTE-THE ANGLE ABC MAY BE PLOTTED BY ARCS, INTERSECTING AT THE POINT C, STRUCK FROM THE POINTS B AND A, AS CENTRES, WITH RADII EQUAL TO BA (OR BC) AND AC RESPECTIVELY.—THE LINE BD HAVING BEEN MEASURED IN THE FIELD, CAN BE SCALED AS A TIE LINE FOR PROOF OF ACCURACY.
CASE 2
R = RADIUS
$BF = FE \times \frac{BD}{AD} = R \times \frac{BD}{AD}$
$BE = FE \times \frac{AB}{AD} = R \times \frac{AB}{AD}$
$BH = R \times \left(\frac{AB - AD}{AD}\right)$
CENTRE OF THE CURVE
FIGURE 1—TO DETERMINE THE LENGTHS OF THE TANGENT LINES B.F. AND B.C. ALSO THE POSITION OF THE MIDDLE POINT H IN THE CURVE F.H.C. WITHOUT THE USE OF TRIGONOMETRICAL TABLES:—MEASURE FROM THE INTERSECTION PEG B ANY EQUAL LENGTHS BA AND BC ALONG THE LINES B.K. AND B.J.—MEASURE THE DISTANCE FROM A TO C AND BISECT IT IN D, THEN MEASURE THE DISTANCE D.B.—— THE SIDES OF THE TRIANGLES A.D.B. AND C.D.B. WILL BE EACH PROPORTIONAL TO THE SIDES OF THE TRIANGLES E.F.B. OR E.C.B.——
NOTE—IN FIGURE 2, THE ANGLES AT B CAN BE TAKEN WITH A BOX SEXTANT, SUFFICIENTLY ACCURATE FOR ALL PRACTICAL PURPOSES.
INTERSECTION PEG
TANGENT PEG AT END OF CURVE
THE CHAIN IS STRETCHED FROM C TOWARDS B IN LINE CB
THE OFF-SETS CAN BE MEASURED WITH A TAPE FROM POINTS ON THE CHAIN LINE
LINE OF BISECTION
RADIUS OF CURVE
CASE 3
FIGURE 2
NOTE—THE ZERO ON THE CHAIN LINE IS PLACED AT THE TANGENT PEG ON THIS SIDE OF THE POINT OF BISECTION
TANGENT PEG AT BEGINNING OF CURVE.
WHEN TRIGONOMETRICAL TABLES ARE AVAILABLE THE FOLLOWING METHOD MAY BE ADOPTED:—
(1) TO DETERMINE THE LENGTH OF THE TANGENT LINES B.F. AND B.C. TO BE MEASURED ALONG THE LINES B.A. AND B.C. RESPECTIVELY, FROM THE INTERSECTION PEG AT B.
$\frac{BC}{EC} = \text{COT } EBC = \text{COT } \frac{1}{2} ABC$
$BC = RAD \times \text{COT } \frac{1}{2} ABC$
(2) TO DETERMINE THE DISTANCE OF THE MIDDLE POINT H OF THE CURVE F.H.C. FROM THE INTERSECTION PEG B.
$\frac{EB}{EC} = \text{COSEC } EBC = \text{COSEC } \frac{1}{2} ABC$
$EB = EC \times \text{COSEC } \frac{1}{2} ABC$
$BH = EB - RAD = RAD\left(\text{COSEC } \frac{1}{2} ABC - 1\right)$
ABE = EBC

The Student's Column.

LAND SURVEYING AND LEVELLING.

XIII.—SETTING OUT CURVES.

THE method illustrated in Case 2 may be adopted when the angle between the tangent lines at their point of intersection is less than 120°, and the radius of the curve to be set out is less than five chains, or 330 ft. The point B at the intersection of the base-line B K and B J having been determined by placing a ranging rod at B, so as to appear in the direction of these two lines; a certain distance, say one chain, or two chains, is measured from B to A, and the same distance from B to C along these base-lines. If the distance between B and C be then measured and bisected in D, and the line joining B to D be also measured, we shall have formed two right-angled triangles, B D A and B D C, the length of the sides of which will now be known. These lengths can next be employed to calculate the required lengths of the sides B F, B E, and B G, in the triangles B E F and B E G, where F E and F G represent the radius of the curve F H G; and B F, B G represent respectively the lengths of the tangent lines drawn from their point of intersection to the commencement and end of the curve. It will be seen that the triangle B D C or (B D A) is similar to the triangle B E G (or B E F), because the angles at B are common to both triangles, and the right angle B D C (or B D A) is equal to the right angle B G E (or B F E).

The required radius is decided upon by experiment. If it is necessary for the curve to pass through or near certain points, such as F, H, and G, a longer radius would be found to increase the lengths of the lines B F, B H, and B G, while a shorter radius would reduce the lengths of these lines.

The same length for the tangent lines may be arrived at by the process illustrated in Case 3, but the operation is here assisted by taking the angle between the tangent lines at their point of intersection with an optical instrument, and afterwards calculating the required measurement for the length of the line B F, B H, and B G, with the use of trigonometrical tables (see *Builder*, Sept. 10, pp. 376, 377).

In the triangle B G E (fig. 2), B G would

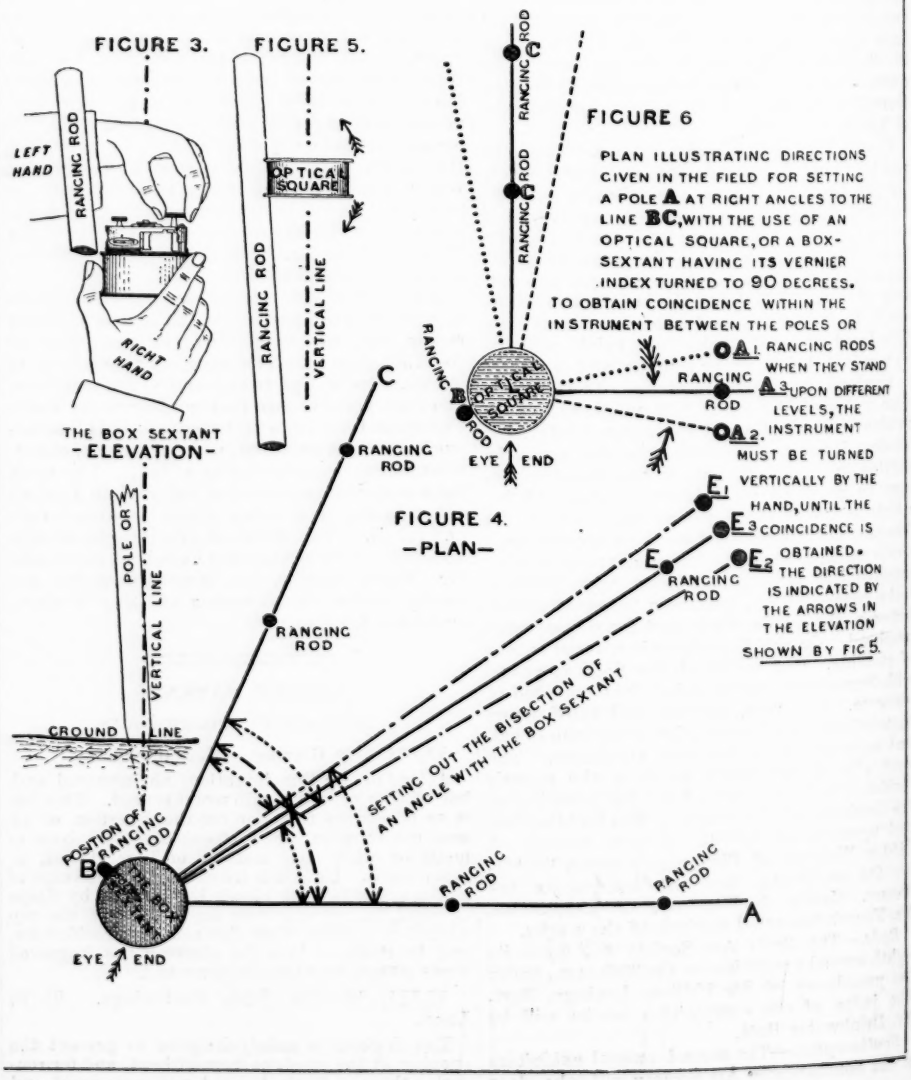


FIGURE 3.
LEFT HAND
RANGING ROD
RIGHT HAND
THE BOX SEXTANT
-ELEVATION-
FIGURE 5.
OPTICAL SQUARE
RANGING ROD
VERTICAL LINE
FIGURE 6
PLAN ILLUSTRATING DIRECTIONS GIVEN IN THE FIELD FOR SETTING A POLE A AT RIGHT ANGLES TO THE LINE BC, WITH THE USE OF AN OPTICAL SQUARE, OR A BOX-SEXTANT HAVING ITS VERNIER INDEX TURNED TO 90 DEGREES.
TO OBTAIN COINCIDENCE WITHIN THE INSTRUMENT BETWEEN THE POLES OR A1 RANGING RODS WHEN THEY STAND UPON DIFFERENT LEVELS, THE INSTRUMENT MUST BE TURNED VERTICALLY BY THE HAND, UNTIL THE COINCIDENCE IS OBTAINED. THE DIRECTION IS INDICATED BY THE ARROWS IN THE ELEVATION SHOWN BY FIG 5.
A3
A2
E1
E3
E2
RANGING ROD
OPTICAL SQUARE
EYE END
FIGURE 4.
-PLAN-
POLE OR VERTICAL LINE
GROUND LINE
POSITION OF RANGING ROD
SETTING OUT THE BISECTION OF AN ANGLE WITH THE BOX SEXTANT
RANGING ROD
RANGING ROD
RANGING ROD
A

represent the base, G E the perpendicular, and B E the hypothenuse, of a triangle for determining the correct trigonometrical expressions to be employed. In the triangle B F E we have B F as the base, F E as the perpendicular, and B E as the hypothenuse. To determine the length of the tangent lines, B F or B G, we *assume* a radius which fixes the length of the side of the triangle denominated as a "perpendicular," and then we calculate the length of the "base," by the application of the equivalent furnished by the tables for "the length of the base divided by the length of the perpendicular," in a triangle having the angle F B E. Similarly to determine the length of B H, we calculate the length of the hypothenuse from the assumed length of the perpendicular in the triangle, and subtract from the length of B E the length of the radius H E.

Fig. 3 shows the method of holding the box sextant over the point B in fig. 2, when taking the angle A B C. The value of the angle so obtained is bisected, and the direction of the line B E is set out by placing a ranging rod anywhere in the line B E, so that the angle E B A is half the angle A B C. The position of this line B E should be checked by setting out the line B E, from the side B C. If any difference is found by this checking, in the position of the pole to be placed upon the line bisecting the angle, A B C, we have only finally to fix the pole E midway between the two points arrived at, after taking the half-angle separately upon each side of B E, as indicated by the dotted lines in fig. 4. But when two poles are set up for view upon each of the lines B A and B C respectively, and the pole at B is carefully pulled upon one side out of the perpendicular, as shown in fig. 3, to enable the centre of the instrument to be vertically over the point B, and at the same time in line with the two poles viewed, the angle A B C may be taken with sufficient accuracy by means of a box sextant to obtain the half-angle correct enough for all practical purposes.

To determine intermediate points in the curve between F and H, and between G and H (fig. 2), we can apply the formula give in Case 1 (*Builder*, Sept. 17, p. 412), for the measurement of offsets from the tangent lines F B and G B, as it will be observed in the diagram which illustrates Case 1, that so long as the tangential angle B A D remains comparatively small, the length calculated for B S may be measured from D at right angles to the tangent line, to determine a point in the curve. Hence, substituting the term "distance" measured along the tangent line for the term "chord" in the equation (Case 1), we obtain for Cases 2 and 3 the formula,—

$$\text{Offset} = \frac{\text{distance}^2}{2 \text{ radius}}.$$

Books.

The Common Health. By B. W. RICHARDSON, M.D., F.R.S. London: Longmans, Green, & Co. 1887.

OF the thousands of those who daily move about their various occupations and constitute our population, how few give even a passing thought to the art of living, beyond what applies to their immediate wants and pleasures. The devoting of any special time or attention to acquiring knowledge on such a subject would seem to many actually ridiculous. The generality of people live their lives in easy acquiescence with things as they find them, and take little trouble to acquaint themselves with the physical problems of life. There is no excuse now for their being ignorant of the fundamental laws of health, for Dr. Richardson's little book, which he has appropriately dedicated to Mr. Godwin (the late Editor of the *Builder*, one who has spent so much of his life in trying to get people to look at the truth in regard to sanitary matters), will bear more than one reading, so startling is the matter and so binding on the attention.

Dr. Richardson commences his dissertations *ab initio*, and shows into what mistakes we fall during the seedtime of health; perhaps he rather overdraws the picture, for if we are to accept his view as the normal state of things, it would seem matter for wonder that any children at all emerge from that perilous position, let alone in the proper condition of stamina for after-life. To childhood succeed education and recreation, the latter of which we only look upon as a matter of convenience, while the education is piled on with ruthless disregard to the too often weakly frame that has to bear it; and now that the system of competitive examinations, which formerly only applied to boys and young men, is extended to girls, the evils induced are more patent than ever. Dress, in all that relates to health, naturally has a chapter devoted to it, and as naturally brings woman to the fore as to her capabilities for nursing and as a sanitary reformer. Upper and Lower, or in other words, London as it should be, is deeply interesting, although perhaps a little Utopian, especially as to the renovation of Upper London. However, it is good to hear such plain speaking as Dr. Richardson gives us, even if a little exaggerated (as all "prophets" do exaggerate); and let us hope that the advocated reforms may soon follow.

Notes on Concrete and Works in Concrete. By JOHN NEWMAN, Assoc.M.Inst.C.E. London: E. & F. N. Spon.

A VERY practical little book, carefully compiled, and one which all writers of specifications for concrete work would do well to peruse. The author does not lay down his own opinion without proof, but he gives quotations from various indisputable authorities, and then draws evident conclusions from them. The book contains reliable information for all engaged upon public works. The author deals with the question of the comparative fineness and weight of Portland cement. He shows that to specify too heavy a cement is to invite a manufacturer to deliver residue, and that a weight test alone, without naming a specific degree of fineness, can give no certain indication of strength. He draws attention to the importance of specifying either the number of meshes per lineal inch in a sieve measuring both ways, or else to state the size of the wire in a sieve, and the size of the openings when used for testing the fineness of the grinding in a cement. He recommends that a detailed analysis of the composition of Portland cement should accompany its delivery at the works. The time at which cement is weighed, whether immediately upon its receipt from the manufacturer's or after some days' storage, is also seen to exert an influence upon the result. The period and conditions required for tests of neat cement are further enlarged upon. In a series of very elaborate and useful experiments made by Mr. Grant, of the Metropolitan Board of Works, when acting as resident engineer for the main drainage works of the metropolis, the cement was required to pass through a sieve of 400 holes to the square inch, and the weight of the shifted cement had to be 110½ lb. per striked bushel. At the Dover Harbour works the same degree of fineness was required for a cement weighing 120 lb. a bushel. The cement employed is often stated to be required to pass through a sieve of 2,500 meshes to the inch, leaving a residue of only 10 per cent. These references show how different are the general opinions that are entertained upon the subject, and yet how often, when concrete work is to be specified, the designer takes up the first specification he can lay his hands upon, and blindly copies it, supposing it will be adopted. A perusal of Mr. Newman's valuable little handbook will point out the importance of a more careful investigation of the subject than is usually supposed to be necessary. The author's chapter upon sand, gravel, and stone is thoroughly practical. He also deals with the shipping and air-slacking of cement, the composition, mixing, and setting of concrete in different situations, and the depositing in place by barrows, blocks, and bags.

Designing Wrought and Cast Iron Structures. By HENRY ADAMS, M. Inst. C.E., M. Inst M.E. London: 60, Queen Victoria-street.

THIS little pamphlet, consisting of thirty pages and two large folding plates, forms Part IV. of an instructive series, and contains notes, calculations, tables, stress diagrams, and working drawings for a trussed fir beam with a rolling load, a cast-iron stanchion calculated to bear a required dead load, and the consideration of the arrangement and calculations required in riveted joints. Such pamphlets, containing *actual* examples which occur in practice, properly worked out, are of great value, but we regret the occurrence of certain misprints, such as on p. 6 the expressions $\frac{Wl}{70}$ and $\frac{Wl}{140}$ ought certainly to be reversed for a distributed and central load respectively. On p. 11, line 2, in describing holding-down bolts, the letter "t" is omitted in the copy before us. On page 12, under the heading "Weight of Structure," the angle-iron 4 in. × 3 in. × $\frac{3}{8}$ = 2 × 2·5 cub. in. × 1 ft. 7 in. long, should be 26 lb., not 8 lb. On p. 13, the item cast-iron strut (exclusive of pattern), 60 lb. at 2d. would be 10s., not 10s. 6d. as stated; and the item, wrought-iron in bolts, nuts, washers, tie-rods, and short pieces angle-iron, weighing 2 cwt. 0 qr. 17 lb. at 20s. would cost 2*l.* 3s., not 2*l.* 2s. 1d. Also, same page, the item for flanged rail and bending, 3 cwt. 0 qr. 16 lb., at 10s., would come to 1*l.* 11s. 5d., not 1*l.* 11s. 7d. Again, on p. 25, under the heading "Cost of Stanchion," the weight should be 0·31 tons, as stated on p. 12. The decimal point is omitted on p. 13. The author has probably entrusted the working out of his results to an assistant, and not checked them with sufficient care himself. Those who are studying the subject for the first time, can not be otherwise than puzzled at these blemishes, which we trust may be corrected in a future edition.

The author would have done well to explain the introduction of the constant in the expression $\frac{Wl}{140}$ upon page 6. His remarks upon the use of double rods in page 9 are very practical. There is an unfortunate ambiguity in the author's description of cruciform and ⊢ section stanchions. We think the expression "least breadth," which is usually adopted in the application of Gordon's formula, would be more intelligible than "diameter over arms" upon page 16. When comparing the strength of a cruciform section upon page 18 with a hollow cylindrical column, the author seems to have forgotten that at the commencement of his chapter he led us to judge that he would have said something about the relative strength of an ⊢ section. According to Hodgkinson's experiments, the relative strengths are in the following proportions, all the pillars being of the same weight and length and rounded at the ends (see "Phil. Trans.," 1840, pp. 413-449).

Hollow cylindrical pillar	–	100
⊢ shaped stanchion	–	75
+ shaped pillar	–	44

Hence the author's remark of "nearly double the strength" upon page 18 applies only to the cruciform section.

STAINED GLASS.

Andover.—Three stained-glass windows have been placed in the chancel of Christ Church, Swannell, Andover, to the memory of the late Lieut.-Col. Earle. They represent our Saviour's sayings of himself,—"I am the Bread of Life," "I am the true Vine," and "I am the good Shepherd," and were designed by Mr. P. H. Newman. When funds are forthcoming it is proposed to fill the other windows of the building with illustrations of Scriptural allusions to agricultural subjects, as appropriate to the locality.

Dundee.—We learn from the *Scotsman* that Messrs. Barnett & Sons, glass-stainers, Leith, have just completed for St. Joseph's Roman Catholic Church, Dundee, a large memorial window, which consists of three lancets, having overhead a circular light in which is represented a dove (emblematic of the Holy Spirit) hovering over the group of figures below. The latter consists of the Virgin with the infant Jesus in her arms, and in the side lights sitting and kneeling figures of saints. The Virgin is represented standing on a globe on which the greater part of the western hemisphere is faintly outlined, her foot upon the head of a twining serpent. In the side lights are representations of St. Anna, St. Joseph, St. John, and St. Dominic. These are flanked by two smaller lancets containing figures of St. Andrew and St. Patrick.

Taunton.—A memorial window on the north side of the chancel of the Church of St. Mary Magdalene, Taunton, has just been erected by Messrs. Clayton & Bell. It is a three-light window, representing St. Mary, B.V., in the central compartment, St. Joseph being in the western, and St. John in the eastern light. It is stated that the oak screen, which originally stood in the church, has been erected in Bampton parish church, which has lately been reopened after the completion of repairs and alterations.

Wangford.—The old parish church at Wangford, Suffolk, has lately been restored, and a

four-light west window has been erected to the memory of the late Earl of Stradbroke, by the members of his family. The window represents "Our Saviour driving the Money-changers from the Temple" in the left-hand light, while the two centre openings are occupied by the subject of "Solomon Building the Temple" (as appropriate in reference to the recent restoration of the church), and the fourth light represents "The bringing back of the Ark to the Temple by the Priests." These three subjects are surmounted by Perpendicular canopies, having in each case a corresponding base. There is some very intricate tracery in which floating angels bearing shields, with the "Alpha" and "Omega," and emblems of the four Evangelists form the principal part. The window was designed and executed by Messrs. Gibbs & Howard, of London, under the superintendence of Mr. E. L. Blackburn, architect, of Winchester.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

SEPTEMBER 12.

By WOODS & SNELLING.

Rotherhithe—13, Prince's-street, freehold	£275

By SCHOFIELD & EVANS.

Marylebone—12, Great Chesterfield-street, 11½ years, ground-rent 13*l.*	240

SEPTEMBER 13.

By H. RUTLEY.

Holloway—2, Cornwallis-road, 76 years, ground-rent 6*l.*	275
Kentish-town—71, Fortess-road, 77 years, ground-rent 10*l.*	380
Edgware-road—26*a*, Queen-street, 13 years, ground-rent 13*l.*	255

By W. S. LYON.

Richmond, Paradise-road—Two freehold houses, and a schoolroom	1,000
Brompton—30, Ovington-square, 37 years, ground-rent 10*l.* 10s.	1,800

By T. STEVENS.

Marylebone—28, Samford-street, 38 years, ground-rent 4*l.*	220

By J. MORGAN.

Sutton, Grove-road—Freehold ground-rents of 125*l.* 10s. per annum, reversion in 63 years	3,015

By DEBENHAM, TEWSON, & Co. (at Lowestoft).

Suffolk, Hopton—Hopton Hall Estate, containing 71a. 2r. 19p., part freehold and part copyhold	3,000

SEPTEMBER 14.

By WARD & CLARKE.

Teddington, Lodge-road—Two plots of land, freehold	325

By C. P. WHITELEY.

King's-cross—Freehold ground-rents of 40*l.* per annum, reversion in 56 years	975
Soho—24 and 25, Peter-street, freehold	810

By ALFRED SPAIN & SON.

Harwich, George-street—A plot of freehold land	30
Poplar—227, High-street, freehold	495
11 and 13, Hill-street, freehold	180

SEPTEMBER 15.

By F. J. BISLEY.

Rotherhithe—480, Rotherhithe-street, freehold	185
34, Abbeyfield road, 68 years, ground-rent 4*l.*	240

By FOSTER & CRANFIELD.

Hornsey, Etherley-road—The residence called "The Limes," 90 years, ground-rent 12*l.* 12s.	290
13, Waldegrave-road, 92 years, ground-rent 6*l.*	220
70, Westfield-road, 80 years, ground-rent 5*l.*	145
Kingston-on-Thames, Birkenhead-avenue—The residence called "Brooklands," 99 years, ground-rent 10*l.* 10s.	270

Miscellanea.

Automatic Controlling Appliance for Lightning Conductors.—The *Electrotechnischer Anzeiger* remarks that lightning conductors have been found defective in one respect, there having been no means of ascertaining whether lightning has been conveyed through them. According to a method patented by Messrs. Hoyer & Glahn (of Schönebeck, on the Elbe), an insulated copper wire is introduced into the conducting apparatus and is wound round an iron core. The core ends in a plate, over which a small magnetic steel plate is suspended. The latter communicates with a registering appliance, by which its movements are recorded. When a current of electricity passes through the conductor the iron core becomes magnetised and attracts the corresponding pole of the small steel plate. After the cessation of the magnetic action the small plate will remain in its position on account of the attraction existing between one of its poles and the iron core previously mentioned. From the position of the indicator it will then be possible afterwards to determine whether lightning has passed through the conductor, and in what direction. In order to restore the appliance to its original condition the indicator is turned back, the small steel plate being thus liberated and again suspended. It is stated that several hundreds of these appliances are already in use.

Excavations of the Ancient City of Sybaris.—According to a statement recently made in a Naples journal, the Italian Government has decided upon granting the funds required for excavating the site on which the ancient city of Sybaris stood, the home of the Sybarites, situated in the bay of Tarento. In a work on "Great Greece," the well-known French archæologist, M. Lenormant, clearly and distinctly fixes the site of the city destroyed some 2,400 years ago, so that no more difficulty is anticipated in finding it than was the case with Olympia. By the bay of Tarento, in the domain which has justly been called Magna Græcia, Sybaris was the leading city, excelling in wealth and magnificence any other Hellenic colony along this lovely coast. However, as is generally known, the effeminate Sybarites were conquered by the inhabitants of the sister town Kroton, the city of Pythagoras. It was razed to the ground, and the ruins caused temporarily to disappear by diverting the waters of the river Kratis across the site. In the course of centuries a layer of earth nine mètres in thickness has been formed over the ruins. The destruction of the city took place in the year 510 B.C., but it is nevertheless believed that objects may still be found among the ruins which will give a vivid picture of Hellenic culture and life at that remote period, perhaps as vivid as those of Rome at a later period rendered by Pompeii, particularly as the latter was only a little village, whilst Sybaris was the principal city of the Hellenic colonies in Italy. The ruins of the city are situated near the railway station of Buffalonia, in the fertile valley through which the river Kratis runs, close to the little town of Cassano.

Destruction of Zinc from Contact with Brickwork.—The *Deutsche Bauzeitung* remarks that in the Berlin Market Buildings, Nos. II. and III., zinc roofing, which had been laid upon brickwork without the employment of any intervening substance, exhibited after a short time perforations and other signs of injury. These were more particularly apparent at the eaves, and only at the portions where the zinc had been in immediate contact with the brickwork. Analysis proved that the latter contained soluble salts to the extent of 1·14 per cent., and that this proportion was sufficient to cause the injury which had resulted. The destructive process had, moreover, been hastened in its operation by damp from the brickwork which had not completely dried. The use of a layer of *carton-pierre*, or similar material, between the zinc and the brickwork is consequently strongly advocated by Herr Schulze in the above-named journal.

Whichcord Memorial.—Our readers will be interested to know that a memorial to the late Mr. John Whichcord, F.S.A., who died January 9th, 1885, aged sixty-one years, has been erected by his widow at Kensal Green Cemetery, where it forms a conspicuous object, the height being 12 ft. 6 in. The material is Portland stone, and the design is by Mr. E. R. Robson, F.S.A.

Sale of Building Land.—On Thursday evening last, at the King William the Fourth Tavern, East Greenwich, a sale was held of sixty-one plots of building ground, in Marsh-road, and a newly-formed street leading therefrom, and called Azof-street. The plots were mostly of 15-ft. frontage, and those with a depth of about 50 ft., realised from 42*l.* to 45*l.*; those with a depth of 75 ft. to 90 ft., 52*l.* to 55*l.* Three front plots, 16 ft. 6 in. frontage and 80 ft. in depth, realised 63*l.* each. Most of the plots were sold, all of which were charged with a contribution of 4*l.* each towards roads and sewerage.

Action of Frost upon Fresh Mortar.—The *Deutsche Bauzeitung* recently quoted the results of experiments made at Schandau as to the effect produced by adding salt in various proportions to the water used in mixing mortar; the fact that mortar made with sea water resists frost better than that made with fresh water having suggested these tests. Samples were subjected to variations in the winter of at least 14 degrees between day and night temperature (the latter descending as low as 17° F.). Those which had been mixed with fresh water were found after twenty-one days' exposure and seven days' sojourn in a heated room, to have lost their consistency, while those with which salt had been mixed (up to the proportion of eight per cent. of the water) possessed various degrees of resistance, indicating the efficacy of the admixture.

Registration of Plumbers in Manchester.—The master and operative plumbers of Manchester last week respectively met to consider the question of registration in the trade, and each meeting has declared in favour of the scheme. The matter is one of considerable public moment, and the present movement is intended not only to raise the status of the craft, but also to afford the public some protection against bad workmanship. The "Worshipful Company of Plumbers" is one of the London Guilds that has endeavoured to make itself really useful to the trade it represents. It is 500 years since the Plumbers' Company made an ordinance that "no one of the trade of plumbers shall meddle with works touching such trade except by the assent of the best and most skilled men in the said trade, testifying that he knows how well and lawfully to do his work, so that the said trade may not be scandalised or the commonalty damaged and deceived by folks who do not know their trade." He would be a bold man who ventured to assert that there are not instances within this district,—not to go further afield,—where the commonalty is "damaged and deceived by folks who do not understand" the trade of plumbing. To say that there are incompetent men and incompetent masters in all trades may be true, but is neither consolatory nor a good argument against the adoption of any feasible plan by which efficient plumbing may be secured. Probably no artisan holds the keys of disease in his grasp so completely as the plumber, who by good workmanship may exclude forces inimical to health, or by his incompetency may give entrances to malign influences that inflict suffering and even death upon their victims. As the result of the Congress convened by the Plumbers' Company at the Health Exhibition, there has been established a "General Council to secure the greater efficiency of plumbing and draining work in dwelling-houses." This Council includes representatives of the trade and of the general public, and its Registration Committee decides upon the claims of all candidates to be considered masters of their craft. The man who satisfies an impartially constituted body receives a certificate as a registered plumber. Degrees are becoming more varied in form, and R.P. will give the public to understand that the rightful owner of that literal addendum has given substantial proof that he is a master of the art of plumbing. Much will, of course, depend upon the constitution of the Local Council. The Manchester masters have elected twelve representatives, the operative plumbers have nominated the same number, and at a subsequent meeting the public will be asked to appoint a third dozen. In this way the interests of the trade and of the community are harmonised, the competent workman is duly recognised, and the public safeguarded from absolute ignorance and incapacity.—*Manchester Guardian.*

Paint for Soft Boards.—The *Thonindustrie Zeitung* quotes a receipt for a paint, equally effective and durable, which can be applied with an ordinary brush to soft boards:—2½ lb. good joiners' glue, 1$\frac{1}{16}$ oz. powdered bichromate of potash, 3½ oz. aniline brown, 2½ gallons water. These materials are mixed in a metal pot and six hours afterwards heated to boiling point, the mixture being applied at a moderately warm temperature. The object of postponing the heating is to allow the glue to expand and dissolve easily without burning, its cohesive properties being thus unimpaired. In a few days, under the influence of daylight, this coloured paint becomes quite waterproof and insoluble. The above quantity, which would be sufficient for five medium-sized rooms, costs about 3s.

Protection of Lightning Conductors on Chimneys.—*The Illustrirte Zeitung für Blechindustrie* recommends the following method of protecting the copper wires of lightning conductors on factory chimneys from being affected by the fire gases to the influence of which they are subjected. The wires thus exposed should be first provided with an insulating covering of india-rubber, over which a protective composition should be applied of the thickness of 2-5ths of an inch. The latter is prepared by mixing ground fire-brick with finely chopped straw and clay-water into a moderately thick paste. After the composition has dried, asbestos string should be wound round it so as to prevent its crumbling away.

Romney-on-Sea.—The Littlestone Estate, within three-quarters of a mile of the town of New Romney, has been laid out as a new watering-place, the land having been disposed of for that purpose by the Corporation of that ancient borough, one of the original Cinque Ports. Between forty and fifty houses have already been erected, and others are being built on the parade facing the sea. The whole of the land is freehold, with the land-tax and tithe redeemed. On the 9th inst. the first portion of the estate was offered for sale at the Railway Station Hotel, Romney-on-Sea. There was a good attendance of visitors, the South-Eastern Railway Company having run a special train from Charing Cross and Cannon-street. About eighty plots were sold, including a site for a large hotel on the Parade. This plot, 150 ft. by 150 ft., which realised 950*l.*, was sold subject to the condition that the purchaser is to erect a hotel in accordance with plans approved by the licensing authorities, and for which a provisional licence has been granted. Four corner plots on the Parade, 30 ft. by 80 ft., were sold, three for 135*l.* per plot, and one for 120*l.* Twenty other plots on the Parade were sold; these were 20 ft. by 80 ft., and they realised from 95*l.* to 105*l.* per plot. The other land offered was situated in three new roads, at right angles with the sea-front, viz., the Littlestone-road, direct from New Romney to the sea (the railway station is in this road, midway between the old town and the sea), the Queen's-road and the Victoria-road. In the Victoria-road and Queen's-road, plots 20 ft. by 150 ft. were sold for 50*l.* per plot. In the Littlestone-road plots 20 ft. by 150 ft. were sold for prices varying from 50*l.* to 57*l.* 10s. per plot. With the exception of the hotel plot, the buildings on all the foregoing plots are to be private houses. Near to the railway station in the Littlestone-road fifteen plots were sold for shops, 18 ft. by 120 ft. these realised prices varying from 65*l.* to 75*l.* per plot. It is proposed to offer a second portion of the estate for sale in the spring of next year. The roads of the new town are already lighted by gas. The promoters of this enterprise for changing an old Cinque Port which has, till quite recently, been without a railway station nearer than fourteen miles, expect that the very extensive sands extending to Dymchurch, three miles to the north, and to Dungeness, five miles to the south, will prove a great attraction to visitors. At places these sands are nearly a mile wide at low-water, and the country folk tell of races once having been held on them, and they are now used as a riding ground by the neighbouring gentry.

Copenhagen.—At the last meeting of the Corporation of Copenhagen, it was decided to erect a new town-hall in that city. It will be situated in a central position facing the Haymarket, and continued to the West Bridge. In the building will be located the whole civil administration of the city of Copenhagen. As, however, designs and estimates have to be invited for the new hall, and decided upon, it is hardly probable that the work of erection can be taken in hand before the early part of 1889. On the same occasion the subject of improving the overcrowded and unsanitary part of the city was discussed, as well as the extensive building operations decided upon to be effected during the next few years. There are to be erected a new prison, new workhouses, and barracks, besides which the market-places are to be regulated, the fire-brigade extended and re-organised, the hospital at the Blegedam enlarged, and the water and gas supplies of the city extended and improved. The total cost of these extensive works is estimated at about 1,000,000*l.* It was also stated that there were then over 4,000 residences (flats) to let in Copenhagen, most of which were intended for the humbler classes, being 750 more than at the same period of 1886. The medical and hygienic journal *Ugeskrift fer Læger* (weekly journal for physicians) recently discussed the proposal for new hospitals in and near Copenhagen, and expressed the opinion that it would be far more preferable to erect a number of small buildings than one large one.

The English Church at Copenhagen.—The stained-glass windows in the chancel of this church have been presented by Sir Francis Cook, and the west windows by his Excellency the Hon. Sir Edmund Monson, K.C.M.G., her Majesty's Minister in Denmark, the whole work being by Messrs. Heaton, Butler, & Bayne, of Garrick-street, London.

The New Post-office Buildings in St. Martin's-le-Grand.—Active preparations are being made for the commencement of the new Post-office buildings in St. Martin's-le-Grand, and this week the second sale of the materials of the buildings to be removed has taken place. Messrs. Horne, Son, & Eversfield disposed of the materials of the Queen's Hotel, the building known as the Railway Receiving Offices, together with a large block of warehouses and other premises in Angel-street, Bull and Mouth-street, and King Edward-street, previous to the demolition of the buildings and clearing the site. The block at the corner of Bull and Mouth-street and King Edward-street, and also a large block between Angel-street, King Edward-street, and the churchyard of St. Botolph, Aldersgate-street, have already been taken down; and when the materials of the buildings sold this week are removed the entire site for the intended new Post-office buildings will have been cleared, with the exception of the French Protestant Church, which still remains standing, owing, we learn, to a difference between the church authorities and the Post Office as to the sum to be paid by the latter in compensation. It is stated that the Post Office authorities have offered 20,000*l.* for the church and grounds, but that the representatives of the church want 31,000*l.*, and the probability is that the claim will have to be decided by arbitration.

Proposed Agra Water-works.—A plan for furnishing Agra with a purer supply of water has been under discussion for some years. Heretofore, however, it has been but a scheme. Now that the Municipality have resolved to push forward the project, it may be considered that there is every prospect of the inhabitants seeing their wishes fulfilled. The source of supply is to be the Jumna, which will provide comparatively clean water, and in sufficient quantity, during ten months of the year, the discharge falling in the hot weather, *i.e.*, May and June, to about 50 ft. per second; and, in addition to the decrease in the supply, the water at this season contains an amount of organic matter. The system of filtration has not been finally settled; the choice is said to lie between the lime and metallic iron processes. The distribution of water is to be effected through twelve miles of piping, furnished with stand-posts on three patterns, viz., the ordinary one with two or four taps, those with roofs and cattle-troughs for bazaars, &c., and others for filling bullock *mussaks* to provide a supply for the outskirts of the town to where the pipes do not lead.—*Indian Engineer.*

A Dust Destructor for Hornsey.—The Hornsey Local Board, on Monday night, decided, with only one out of fourteen members in opposition, to adopt the scheme of their surveyor and engineer, Mr. T. de Courcy Meade, C.E., for the erection, at a cost of about 12,000*l.*, of a destructor for cremating the dust and house refuse of the parish of Hornsey, which contains a population of 40,000. Mr. Meade submitted a set of elaborate plans, and his scheme, which was characterised as a most complete one, was adopted in its entirety. The destructor is to be fitted with the Jones Fume Cremator, and it was asserted by several members who have inspected most of the sixty destructors now in operation in various parts of the country that, built upon the lines laid down by the Surveyor, it cannot possibly create any nuisance to the inhabitants. The site selected is on a piece of land abutting on High-street, Hornsey, in close proximity to the mortuary recently erected by Mr. Meade.

Institution of Mechanical Engineers.—An ordinary general meeting of this Institution will be held on Friday evening, the 30th of September, at 25, Great George-street, Westminster, by kind permission of the Council of the Institution of Civil Engineers. The chair will be taken by the President, Mr. Edward H. Carbutt, and the discussion will be resumed on the paper read at the Spring meeting on the 17th of May last, by Major English, R.E., entitled "Experiments on the Distribution of Heat in a Stationary Steam-engine." The following paper will be read and discussed, as far as time permits:—"On Irrigating Machinery on the Pacific Coast," by Mr. John Richards, of San Francisco.

Metallurgy.—A series of lectures and demonstrations on metallurgy will be commenced at King's College, London, on October 10th, by Professor A. K. Huntingdon, with the assistance of Mr. W. G. M'Millan as demonstrator.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	0	0	7	10	0
Teak, E.I. ....load	8	0	0	13	0	0
Sequoia, U.S. ....foot cube	0	2	3	0	3	0
Ash, Canada ....load	3	0	0	4	10	0
Birch ,, ...	2	0	0	3	10	0
Elm ,, ...	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,, ...	2	10	0	4	10	0
Canada	3	0	0	6	0	0
Pine, Canada red	2	0	0	3	10	0
,, yellow	2	0	0	4	0	0
Lath, Dantsic ....fathom	3	0	0	5	0	0
St. Petersburg	4	0	0	5	10	0
Wainscot, Riga ....log	0	0	0	0	0	0
,, Odessa, crown....	2	10	0	3	0	0
Deals, Finland, 2nd and 1st...std.	7	0	0	8	0	0
,, 4th and 3rd	5	10	0	6	10	0
Riga	5	10	0	7	0	0
St. Petersburg, 1st yellow	8	0	0	13	0	0
,, 2nd ,, ...	7	0	0	8	0	0
,, white	6	10	0	8	10	0
Swedish	6	0	0	14	0	0
White Sea	0	0	0	0	0	0
Canada, Pine, 1st	16	0	0	24	0	0
,, ,, 2nd....	10	0	0	15	0	0
,, ,, 3rd, &c....	6	0	0	9	0	0
,, Spruce, 1st	8	0	0	9	0	0
,, ,, 3rd and 2nd....	5	0	0	7	0	0
New Brunswick, &c....	5	0	0	6	10	0
Battens, all kinds	4	0	0	10	10	0
Flooring Boards, sq., 1 in., prepared, First....	0	8	0	0	11	0
Second	0	6	6	0	7	6
Other qualities	0	4	0	0	6	0
Cedar, Cuba ....foot	0	0	3½	0	0	3¾
Honduras, &c.	0	0	3	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4	0	0	6½
St. Domingo, cargo average	0	0	4	0	0	5½
Mexican ,, ...	0	0	3½	0	0	3¾
Tobasco ,, ...	0	0	3½	0	0	5
Honduras ,, ...	0	0	3¾	0	0	5
Maple, Bird's-eye	0	0	5	0	0	7
Rose, Rio ....ton	8	0	0	11	0	0
Bahia....	7	0	0	9	0	9
Box, Turkey ....ton	5	0	0	12	0	0
Satin, St. Domingo ....foot	0	0	5	0	0	9
Porto Rico	0	0	6	0	0	10
Walnut, Italian	0	0	3½	0	0	5½
METALS.						
IRON—Bar, Welsh, in London...ton	4	15	0	5	0	0
,, ,, in Wales	4	2	6	4	10	0
,, Staffordshire, London	5	10	0	6	0	0
COPPER—						
British, cake and ingot ....ton	43	10	0	44	0	0
Best selected	44	10	0	45	10	0
Sheets, strong....	50	0	0	0	0	0
Chili, bars	39	10	0	39	15	0
YELLOW METAL....lb.	0	0	4½	0	0	4¾
LEAD—						
Pig, Spanish ....ton	12	0	0	0	0	0
English, common brands....	12	5	0	0	0	0
Sheet, English	13	5	0	0	0	0
SPELTER—						
Silesian, special ....ton	15	7	6	15	10	0
Ordinary brands....	15	5	0	15	7	6
TIN—						
Straits....ton	102	15	0	0	0	0
Australian	103	0	0	0	0	0
English ingots	106	0	0	0	0	0
OILS.						
Linseed ....ton	20	5	0	20	10	0
Cocoanut, Cochin	31	0	0	32	0	0
Ceylon	23	15	0	24	0	0
Palm, Lagos	22	10	0	23	0	0
Rapeseed, English pale	24	0	0	24	5	0
,, brown	22	15	0	0	0	0
Cottonseed, refined	21	10	0	0	0	0
Tallow and Oleine....	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	6	0	0
,, refined....	5	0	0	12	0	0
TURPENTINE—						
American, in casks ....cwt.	1	4	9	0	0	0
TAR—						
Stockholm ....barrel	0	14	0	0	14	6
Archangel	0	9	6	0	9	9

TENDERS.

BECKENHAM.—For the erection of house, stable, coach-house, &c., in the Wickham-road, for Mr. James Edgcombe. Mr. Alfred Parnacott, surveyor, 156, Westminster Bridge-road, S.E.:—

Kydd	£1,293 15 4
Astell	1,260 0 0
Syme & Duncan	1,225 0 0
Lovelock (accepted)....	1,191 0 0

BERMONDSEY.—For the erection of shop on forecourt, and alteration to house, No. 104, Jamaica-road, Bermondsey, for Mr. S. Wilson. Mr. E. Crosse, architect:—

A. White & Co. (accepted)	£146 0 0

[No competition.]

CHELSEA.—For the erection of Holy Trinity Girls' and Infants' School, Upper Chelsea. Mr. F. W. Roper, architect. Quantities by Messrs. Barber, Boxall, & Barber:—

Richardson & Son....	£4,995 0 0
S. J. Jerrard	3,677 0 0
T. Boyce....	3,673 0 0
J. Holloway	3,650 0 0
C. Wall	3,515 0 0
W. Johnson (accepted)	3,500 0 0

CHIDDINGSTONE (Kent).—For Great Mill Bridge, Chiddingstone. Mr. F. W. Ruck, County Surveyor. Quantities by Messrs. Ruck, Son, & Smith:—

Dover, Wood, & Co., Blackfriars	£899 0 0
Ball & Gammon, Strood	665 0 0
E. Wilkins, Loose	649 0 0
G. E. Wallis, Maidstone	644 0 0
Money Marsland, Chislehurst....	633 1 1
Punnett & Sons, Tonbridge....	613 10 8
James Farrow, Maidstone (accepted).	589 0 0

CONTRACTS AND PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Firewood	City of London Union	*Official*	Sept. 26th	ii.
Public Offices, Kilburn	Willesden Local Board	E. Harnor	Sept. 27th	ii.
Broken Guernsey Granite	do.	O. Claude Robson	do.	ii.
Firewood	West Ham Union	*Official*	Sept. 28th	ii.
Asphalte Paving, Owen-street	Clerkenwell Vestry	do.	Sept. 29th	ii.
Repairing Albemarle-street	do.	do.	do.	ii.
New Sewers, &c.	Holborn Board of Wks.	Lewis H. Isaacs	October 3rd	xii.
Supplying and Laying Victoria Stone	Leyton Local Board	*Official*	October 4th	xii.
General Works, House Drainage, &c.	do.	do.	do.	ii.
Mill-Shed, Bath-Rooms, &c.	Edmonton Union	T. E. Knightley	do.	xii.
Wood-Paving Works	Westminstr Bd. of Wks	G. R. W. Wheeler	October 5th	ii.
Drainage, Roads and Fencing	Putney Burial Board	J. C. Radford	October 13th	xii.
Police Station, Sutton Coldfield	County of Warwick	Wm. Lait	October 14th	ii.
Rebuilding Residences, Cadogan-place	.....	W. M. L. Seaman	Not stated	xii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page
Surveyor and Engineer	Tottenham Local Board	40*l.*	October 11th	xvi.

HAMPSTEAD.—For building an additional story and other works at West-hill Lodge, Hampstead, for Mr. Horatio Webb. Mr. George Edwards, architect:—

Wall Bros.	£697 0 0
Ward & Lamble	685 0 0
Green & Lee	677 0 0
Longmire & Burge	676 0 0
S. Barnett (accepted)	675 0 0

HORSMONDEN (Kent).—For alterations and additions to Sherrenden House, for Mr. J. G. Hodgskin. Mr. Thomas Potter, architect, Sevenoaks. Quantities supplied:—

Pryor & Co., Maidstone	£697 0 0
Wallis & Clements, Maidstone	669 0 0
Wiltshire, Sevenoaks	648 0 0
Martin, Horsmonden	624 0 0
Wm. Brown, Shepherd's-bush*	585 11 0

* Accepted.

KETTERING.—For the erection of club premises in Wellington-street, Kettering, for the Kettering Working Men's Club. Mr. H. A. Cooper, architect. Quantities supplied by architect:—

Rudd & Son, Grantham	£1,432 0 0
Wm. Clough, Broughton	1,302 10 0
Margetts & Neal, Kettering	1,270 0 0
Chas. Sharman, Kettering	1,240 0 0
Saml. Manby, Kettering	1,197 0 0
Jno. Coltman, Kettering	1,190 0 0
Jno. Bellamy, Kettering	1,190 0 0
C. & F. Henson, Kettering	1,187 0 0
H. F. Henson, Kettering	1,177 0 0
Dickens & Mutton, Kettering	1,176 0 0
Geo. Ginns, Kettering	1,172 0 0
Geo. Henson, Kettering (accepted)	1,169 0 0
Edward Barlow, Rothwell	1,150 0 0

LAMBETH.—Accepted for pulling down and rebuilding The Angel public-house, Lambeth-walk, for Mr. J. Craigen. Messrs. Stock, Page, & Stock, architects, 9, Denman-street, London Bridge, S.E.:—

John Beale, Westminster Bridge-road £2,592

[No competition.]

LLANDAFF.—For the erection of a billiard-room at Llandaff House, Llandaff, for Mr. John Gunn. Quantities by Mr. Norman Wight, Cardiff. Messrs. Halliday & Anderson, architects, Cardiff and Llandaff:—

Turner & Sons, Cardiff	£560 0 0
Chas. Bird, Cardiff	507 0 0
D. J. Davies, Cardiff	497 0 0
S. Smallridge, Cardiff	480 0 0
J. Hopkins, Cardiff	480 0 0
A. Trotman, Cardiff	475 0 0
W. Ashley, Cardiff	472 14 9
T. & W. Cox, Llandaff (accepted)	389 0 0

LONDON.—For alterations and additions to No. 26, Wimpole-street, W., and stables in rear, for Mr. Morrant Baker. Mr. Alexander Payne and Mr. F. M. Elgood, joint architects:—

Thomas Boyce	£1,527 0 0
Hall, Beddall, & Co.*	1,476 0 0

* Accepted, with modifications.

LONDON.—For alterations to The Dun Cow, and building two shops adjoining, in the Old Kent-road, for Mr. T. Hill. Mr. J. C. Reynolds, architect. Quantities not supplied:—

Kynoch	£4,200 0 0
Parker	3,985 0 0
Drew & Cadman	3,849 0 0
Croaker	3,833 0 0

LONDON.—For fitting up stabling at Pear Tree-street, Goswell-road, E.C., for Messrs. Carter, Paterson, & Co. (Limited), under the superintendence of Mr. William Eve, Union-court, Old Broad-street, E.C.:—

Brass & Son	£715 0 0
Harris & Wardrop	693 0 0
F. & H. F. Higgs, Loughboro' Junction (accepted)	635 0 0

LONDON.—For erecting workshop, &c., at Whistler-street, Drayton Park, N., for Mr. R. C. Halse, under the superintendence of Mr. William Eve, Union-court, Old Broad-street, E.C.:—

Wilsher	£397 0 0
Harris & Wardrop	394 0 0
Hamlin	359 0 0
Avis & Son	342 0 0
Brown	339 0 0
F. & H. F. Higgs	320 0 0
Clark, Hornsey Park-road (accepted)	318 10 0

LONDON.—For the erection of workshops, warehouse, and show-rooms, in the Westminster Bridge-road, for Messrs. Geo. Wright & Co. Mr. Alfred Parnacott, surveyor, 156, Westminster Bridge-road, S.E.:—

Peacock Bros. (accepted) £1,168 0 0

LONDON.—For repairs, &c., at No. 1, Vernon-place, Bloomsbury, for Mr. Cronin. Mr. T. W. Willis, architect:—

J. A. Taylor	£379 0 0
Ansell	353 0 0
Hackworth	340 0 0

LONDON.—For alterations and additions at No. 78, Goswell-road, for the London Provident Building Society. Mr. T. W. Willis, architect:—

King & Son	£955 0 0
J. Anley	890 0 0
Grant	860 0 0
Flew & Co.	837 0 0
J. A. Taylor	799 0 0

NORWOOD.—For repairs and alterations to seventeen houses, at Norwood, for Mr. C. Blake. Messrs. J. & J. S. Edmeston, architects and surveyors:—

Robson	£5,166 0 0
Gould & Brand	4,433 0 0
Smith & Sons	4,142 0 0
Kynoch & Co.	3,736 0 0
Crapper	3,419 0 0
Taylor	2,398 0 0
Croaker	2,330 0 0
Mayo	2,164 13 6

ORTON (Northants).—For the restoration of All Saints' Church, Orton, Northants. Mr. H. A. Cooper, architect, Kettering:—

Fred. Barlow, Rothwell £290 0 0

PADDINGTON.—For repairs, &c., to No. 12, Talbot-square, Paddington. Mr. A. Parnacott, surveyor, 156, Westminster Bridge-road:—

Bray & Pope	£178 0 0
Peacock Bros.	151 0 0
Lapthorne & Co.	129 0 0

PAIGNTON.—For the erection of a photographer's shop and dwelling-house, on the Girston Estate, Paignton, for Mr. Rawlings. Mr. S. Woodbridge, jun., architect, No. 210, High-street, Brentford:—

H. Rabbich (accepted) £504 0 0

PENGE.—For alterations and additions to Fern Lodge, Oakfield-road, for Mr. Chas. W. Jefferies. Mr. Alfred Parnacott, surveyor, 156, Westminster Bridge-road:—

Lapthorne & Co.	£450 0 0
Burgess & Co.	325 0 0
Lovelock	285 0 0

ST. LEONARD'S-ON-SEA. — For the erection of a new bank, Grand Parade, St. Leonard's-on-Sea, for the London and County Banking Company (Limited). Mr. Richard A. Hill, F.R.I.B.A. (Fowler & Hill), architect:—

Naylar, Rochester	£4,990 0 0
Eldridge & Son, Hastings	4,875 0 0
Adcock, Dover	4,859 0 0
Hughes, St. Leonard's	4,857 0 0
Eldridge & Cruttenden, St. Leonard's	4,821 0 0
White, St. Leonard's	4,800 0 0
H. E. Cruttenden, St. Leonard's	4,738 0 0
Salter, St. Leonard's (accepted)	4,475 0 0

SOUTHWARK.—For rebuilding premises in Park-street and Stoney-street, Southwark, for Messrs. White & Son. Messrs. I'Anson & Son, architects:—

Brown, Son, & Bloomfield	£6,150 0 0
Downs	6,108 0 0
Ashby & Horner	6,068 0 0
Patman & Fotheringham	5,963 0 0
Groves & Sons	5,883 0 0
Killby & Gayford	5,770 0 0
Kirk & Randall	5,742 0 0
J. & J. Greenwood	5,696 0 0
Colls & Sons	5,687 0 0
Brass & Sons	5,637 0 0
Adamson & Sons	5,625 0 0
Balaam Bros.	5,600 0 0
Kynoch & Co.	5,585 0 0
Rider & Sons	5,570 0 0
Nightingale	5,430 0 0

STRATFORD.—For the erection of a manufactory at Stratford, Essex. Mr. Edward Monson, jun., A.R.I.B.A., architect, Acton:—

W. H. Simonds, Reading	£4,070 0 0
W. A. Gibbs, Poplar	4,020 0 0
F. T. Chinchen, Kensal Green	4,000 0 0
S. Sabey & Son, Islington-green	3,997 0 0
E. C. Howell & Son, Lambeth	3,760 0 0
W. N. Dabbs, Stamford-hill	3,755 0 0
G. Munday & Son, Savage-gardens	3,726 0 0
H. Ingram, Woking	3,690 0 0
F. & H. F. Higgs, Loughboro' Junc.	3,600 0 0
G. Stephenson, Bishopsgate-street	3,587 0 0
F. L. Green, Holborn	3,541 0 0
J. T. Chappell, Pimlico	3,448 0 0
Smith Wilkinson, St. Thomas-road	3,425 0 0
Mark Gentry, Stamford	3,290 0 0
F. R. Turtle, Northcote-road	3,125 0 0
W. H. Lascelles & Co., Bunhill-row*	3,088 5 0
J. M. Goodwin, Kilburn	3,085 10 6

* Accepted.

STREATHAM.—For the erection of a new picture-gallery at Park Hill, Streatham-common, S.W., for Mr. Henry Tate. Mr. Sidney R. J. Smith, A.R.I.B.A., architect, 15, York-buildings, Adelphi:—

	With Inner Skylight.	Outer only.
Higgs & Hill, South Lambeth-road	£994	£884
G. Candler, Brixton-hill*	720	635

* Accepted.

SUTTON (Surrey).—For alterations and additions to Camden House, Sutton, for Mr. S. Ezekiel. Mr. E. Douglas Hoyland, architect, 45, Fenchurch-street, E.C. Quantities supplied by Mr. T. Marcus Houghton, Imperial Buildings, Ludgate-circus, E.C.:—

Hickenbotham	£4,725 0 0
Brown	4,590 0 0
Puzey & Lumley	4,165 0 0
Smith	4,158 0 0
Knight & Bennett	4,066 0 0
Page	3,930 0 0
Potter	3,565 0 0

TOTTENHAM. — For works in connexion with the widening of Green-lanes, at certain points between the parish boundary of Finsbury Park and the Alexandra Park Tavern, for the Tottenham Local Board of Health. Mr. W. A. H. de Pape, engineer:—

J. Botterill, Finchley	£3,811 0 0
Grover & Co., Finsbury	3,080 0 0
Woodham & Fry, Greenwich	2,021 0 0
W. Nichols, Wood Green	1,996 4 3
F. Adams, Kingsland	1,966 9 4
Williamson, Green Lanes	1,723 16 7
Bradshaw & Co., Tottenham	1,674 14 11
A. Catley, Lloyd-square, W.C.	1,622 0 0
J. Rendall, Walthamstow	1,614 2 5
J. Bloomfield, West Green	1,543 15 0
J. Wain, Battersea	1,490 0 0

TOTTENHAM.—For the erection of an engine and boiler house, chimney-shaft, water-tower, &c., at the Longwater Pumping Station, for the Tottenham Local Board of Health. Mr. W. A. H. de Pape, engineer:—

C. Dickinson, Loughboro' Junction	£4,549 15 9
Hy. Hilton & Son, Birmingham	4,131 0 0
Geo. Bell, Tottenham	4,060 6 0
C. Wall, Chelsea	4,015 0 0
J. Robson, Snaresbrook	3,904 17 8
Wilkinson, Finsbury Park	3,875 0 0
P. Hart, West Green	3,858 19 9

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